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ART. LXVII.—OBSERVATIONS ON COLLODION.

By Edward Parrish.

More than a year has elapsed since jointly with my friend W. W. D. Livermore, then an assistant in my establishment, I published an article in this Journal (vol. xiv., p. 181) upon the Ethereal Solution of Prepared Cotton, which I believe was the first essay on the pharmaceutical relations of this new and curious compound that appeared. The article had just been introduced to the notice of the profession in Philadelphia by Dr. Maynard, of Boston, one of the claimants for the honor of first applying it to surgical use. Up to that time, all that was generally known of its composition was that it was a solution in ether of fulminating cotton, prepared by the action of nitric and sulphuric acids on cotton.

A very few experiments convinced us that the ordinary commercial gun cotton manufactured by the patentees was nearly always insoluble, and that the directions for preparing gun cotton for explosive purposes were not those best adapted to obtain a good article for solution. After several trials we succeeded in producing an article identical in its properties with that of Maynard & Noyes, the agents of Dr. Maynard, but the formula we used, and which we then published, did not always give a satisfactory result; sometimes the cotton was found to be nearly or quite insoluble, at other times it dissolved rapidly and com-

pletely, but was destitute of any adhesive property, while at others it yielded a product completely answering the end desired. Under these circumstances the essay referred to was written, rather with a view to draw attention to the chemical and pharmaceutical relations of this new and interesting compound, than in the belief that our knowledge of the subject would justify an attempt to prescribe a perfect formula for its preparation, or fully to describe its properties and habitudes.

Having since prepared the collodion very frequently to meet a constant and increasing demand, and having observed particularly the precautions necessary to insure success, we have adopted the conclusion that the recipe then given, modified by changing somewhat the proportion of cotton to the acids, is the best adapted to its successful preparation of any that has been published. The formula of M. Mialhe, published in this Journal, (vol. xv., p. 42,) has been recently very generally adopted, as giving a more uniform and certain product, but we have found it to fail as frequently as the other, and to be much more inconvenient in its execution. It is impossible to make more than a very small quantity at one time, and the operator is exposed to the acid fumes while stirring the cotton with the semifluid mass, to a very inconvenient and even dangerous extent. The process of washing the product is also more inconvenient and tedious by this than by the preceding plan.

Having stated thus much, I will proceed to give the two formulæ, modified so as to correct the error in the proportion of cotton to the acids in the first, and what must have occurred to all who have used it, as an excess of prepared cotton to ether in Mialhe's; the latter has also been changed so as to adapt its phraseology to that of our officinal formulæ.

No. 1. Take of Fuming Nitric Acid, sp. grav. 1.48, and
Sulphuric Acid, each 4 fluid oz.
Cleansed and Bleached Cotton, ½ oz.
Sulphuric Ether, U. S. P., 4 pts.

Thoroughly saturate the cotton with the acids previously mixed, and allowed to become cool, and macerate for twelve hours. Wash the nitrated cotton in a large quantity of water, pick it out into thin layers, and dry it thoroughly by artificial heat; then dissolve it in the ether.

No. 2. Take of Nitrate of Potassa, thoroughly dried and reduced to fine powder, 5 oz.
Sulphuric Acid (concentrated) 4¼ fluid oz.
Clean Carded Cotton, - - 15 grs.
Sulphuric Ether, - - - 2½ fluid oz.
Alcohol, 30 minims.

Mix the nitre with the sulphuric acid in an open glass or porcelain vessel, then add the cotton and agitate the mass by means of two glass rods for three minutes; then pick it out into a thin layer and dry it thoroughly by artificial heat; lastly, dissolve the prepared cotton in the ether, adding the alcohol.

By both these processes we have repeatedly made Collodion of excellent quality. We have also made it by a process more nearly resembling that of J. B. Edwards, published in the last number of this Journal, (which accidentally we did not see till since commencing this essay,) although the result of our experience is, that in order to insure the complete alteration of the cotton, it is preferable to macerate it for from six to twelve hours in the acids, and it is certainly less troublesome than the method of plunging it in very small quantities in the acids for the space of one or two minutes.

The following precautions, however, must be observed in its preparation in order to insure success.

1st. The nitric acid employed in No. 1 must be free from chlorohydric acid, a common impurity; it must be of the specific gravity named, or not less than 1.45. The officinal acid is 1.5.

2d. The sulphuric acid employed in both formulæ should be recently prepared, or if it has been exposed a consider-

able time to the air, should be boiled to free it from absorbed water. I have found the neglect of this precaution the most fruitful source of failure in making the preparation. The officinal acid has the specific gravity of 1.84, which is fully as strong as necessary.

3d. The materials and vessels employed in the process by either method must be dry. The ether must be undiluted with water. The presence of a small portion of alcohol facilitates the solution, though in excess it injures the product by rendering it less volatile. The officinal ether possesses the requisite proportion.

4th. In drying the prepared cotton, care should be taken to apply diffused heat to thin layers only, otherwise the part in contact with the heating surface will become dry before the remaining portion, and be very liable to take fire on any sudden elevation of temperature.

5th. Collodion must be put into vials previously dried, well stoppered either with glass or cork stoppers. In applying it, the parts should be carefully wiped to free them from moisture, and where a permanent plaster is desired, the solution should be repeatedly painted over the surface.

Collodion, as thus prepared, is a clear, colorless liquid, of a syrupy consistence, which, when applied to a dry surface, evaporates spontaneously, yielding a transparent plaster without whiteness, possessed of remarkable adhesiveness and contractility.

Composition of Collodion.

Notwithstanding the difference of opinion which exists as to the chemical nature of this body, it may not be amiss in this place to give some general statements on the subject, with a view to encouraging its further investigation.

There appear to be three substances produced by the action of nitric acid on cotton, *Xyloidine*, *Pyroxyline*, and *Etheroxyline*. *Xyloidine* was discovered by Bracco-

net in 1833, who first prepared it by precipitation from a solution of starch in nitric acid, by adding water; it is very soluble in ether. *Pyroxyline*, is believed to be identical with Schönbein's gun cotton, and is insoluble, or nearly so, in ether. *Etheroxyline*, is completely soluble in ether, with a small proportion of alcohol, and in solution is the substance recently named Collodion.

Whether these compounds are different in composition, or what are the circumstances which give rise to their different reactions, is a question which is yet to be determined. Prof. Schönbein asserts that pyroxyline differs from xyloidine in its being insoluble in acetic acid; while Bracconet maintains the identity of all the compounds of cellulose with nitric acid. Etheroxyline would seem to resemble it still more, though I have never yet met with an article perfectly soluble in ether which possessed the property of exploding without the least solid residue, which is the case with gun cotton of good quality. The existence of these three substances may perhaps account for the fact that our specimens of prepared cotton differ so much in their properties according to circumstances. When the nitric acid is too weak, it dissolves the cotton into an amorphous substance, extremely soluble in ether, but destitute of adhesiveness, which appears to correspond with xyloidine. When the acid is stronger, and contains an abundance of the nitrous acid fumes, we have either pyroxyline or etheroxyline, according as the action has been more or less violent, both having precisely the same texture and appearance, though differing in their solubility and in the completeness of their dissipation by heat.

Pyroxyline having been analyzed, is stated to contain—

Lignin, - - - - -	39.25
Nitric Acid, - - - -	60.75
	100

According to M. Porret, it is a hypo-nitrite of oxide of lignin. He states that he has isolated the oxide of lignin, which he calls *lignea*, and has discovered it to be an alkaline base, which neutralized by hypo-nitrous acid, produces a substance identical with gun cotton. The discovery of this base, if confirmed by future investigations, will be one of the most interesting of modern times, and may throw new light upon some of the phenomena of vegetable growth and decay.

Having already extended this essay beyond the limit intended, I shall pass rapidly over a consideration of some of the

Uses of Collodion.

In addition to the treatment of wounds and the application of bandages, for which it was at first principally recommended, it has since been applied with success to the treatment of burns, the worst cases of which will frequently recover with a single application of the solution, so completely and permanently is the surface protected from irritating causes. Superficial sores and abrasions of the skin are cured by painting them over with the solution. It gives great relief in tetter and various other skin diseases, especially when attended with violent itching. Prof. Simpson, of Edinburgh, recommends it for sore nipples, which it completely protects without interfering with the sucking of the infant. It is also found useful in the dressing of ulcers and of varicose veins, and in a variety of other surgical cases. In France, it is used to apply dressings of gold-beater's skin; and above all, as a substitute for dextrine in permanent splints, which, by its use, they are able to apply over a less extended surface without diminishing the strength and permanence of the dressing.

M. Soubeiran suggests its employment to render fabrics, particularly silk, impermeable to moisture, at the same time that they preserve unimpaired their color and softness. Of

such a fabric he suggests water-proof mantles might be made so light and compact as to be carried in the pocket, and drawn forth when required to protect the person and clothing from the rain.

In the last number of this journal will be found some excellent observations on the uses of collodion, by Chas. S. Rand. Its employment in connection with Venice turpentine as a varnish for labels, protecting them against the action of hot and cold water and alcohol, suggested by him, promises to be one of its most valuable applications.

In Pharmacy, collodion is used for coating pills, and as a vehicle for other external applications. The manner of coating pills is to dry them perfectly, and placing each pill on the point of a needle, to dip them into the solution, and withdraw them immediately, allowing them to dry, and repeating the operation. In this way, pills may be deprived of taste without detriment to their medical properties.

The following process is recommended by M. F. Ilisk, of St. Petersburg, for forming a convenient vesicant:

"*Collodium Cantharidal.*"

Take of Cantharides	- - -	1 pound.
Sulphuric ether	- -	"
Acetic "	- - -	3 fluid ounces.

Mix the ethers together, and treat the cantharides by the displacement process. Then to 2 fluid ounces of this tincture add 25 grains of prepared cotton.

This is to be applied by painting it over the parts.

ART. LXVIII.—NOTE ON INDIA CINNAMON AND RED SARSAPARILLA.

By J. Carson, M. D.

In our paper on India Opium, published in the last number of the Journal, we stated that specimens of several drugs had been put in our possession by Dr. Ruschenberger. Another of them is an article of Cinnamon, so unlike that which is ordinarily presented in commerce, and undescribed in the books, that a description of it may be interesting.

It is in bundles, composed of from 50 to 100 pieces of bark. Each piece is about ten inches in length, the form being that of a quill, or approximating to it; the strip of bark of which it is formed having been half an inch in breadth. Apparently the branches of the tree from which it was procured have been selected with a view to uniformity. The thickness is one line. It is constituted of the entire bark, both liber and epidermis. Externally it is of a light ash color, light and silvery looking in patches; little, or not at all wrinkled, but distinctly tuberculated. Internally it is of a deep brown, and smooth. On first view, it so much resembles in appearance the larger quills of fine Huanuco bark, as to be taken for it. The fracture is short; the odor exceedingly fragrant, and the taste is very warm, sweet and agreeable.

This species of Cinnamon is put up in Ceylon, expressly for the Canton market, where it is in high esteem, and commands a greater price than the ordinary kind. Its taste and flavor are preserved by the inner and outer layers of the bark being retained.

Red Sarsaparilla.

From the same source we have received a specimen of Sarsaparilla, which was given to Dr. R. by Dr. Burt, U.S.N. In the letter accompanying it, Dr. Burt says,—"I send you a specimen of Isthmus of Darien Sarsaparilla, said to be the genuine article by our Consul at Panama, who procured it

for me. It is known in common as Jamaica Sarsaparilla." From comparison, we can see no difference between the Sarsaparilla sent and the article known in commerce as Red or Jamaica Sarsaparilla. The locality from which the article is derived, we conceive to be satisfactorily settled by this communication of Dr. Burt, viz., the most southern part of North America.

ART. LXIX.—ON TINCTURE OF KINO.

Editors of American Journal of Pharmacy:

GENTLEMEN,—Appended to the formula in Wood and Bache's Dispensatory, for preparing Tincture of Kino, is the remark, that "This tincture very frequently becomes gelatinous, and at length loses almost entirely its astringency;" and "until some mode is discovered of obviating this evil, the tincture seems scarcely to be a proper object of officinal direction." Having had repeated occasion to regret the existence, long continued, of the above deficiency in our knowledge of the mode of preparing this tincture, I instituted some experiments with the view of ascertaining the means of remedying the defect. The result was the discovery of the fact, that, by making the preparation with *Proof Spirit*, instead of rectified spirit, as ordered in the Dispensatory, I obtained a tincture which *keeps perfectly well, is more astringent, and less stimulating* than we have before been able to obtain it.

On subsequent investigation, I discovered that an error had been committed in transferring the London formula to the pages of the Dispensatory, by construing "Spiritus Tenuior," which is ordered in the original, as "Rectified Spirit," and hence the defect.* The Dublin College also

*We have not a copy of the London Pharmacopœia at hand, but all the English books we have referred to, quoting that authority, direct Kino and Rectified Spirit as in the U. S. Dispensatory. We have some observations to offer on this subject, but will take advantage of a future occasion to present them.—ED.

prescribes proof spirit, and Pereira asserts that this tincture does not spoil, to his knowledge, when prepared with good kino, noticing, at the same time, the observation I have quoted, and attributing the circumstance to the probable employment of an inferior article, overlooking the plain fact of the difference in strength of the spirit used. Without entering into any disquisition as to the *rationale* of the advantage of the difference in the menstruum recommended to be used in the preparation, I will merely submit the fact to you, which I have tested by a year's trial, and which seems to me to be of sufficient practical importance to entitle it to a place in your Journal, through which it may be the means of restoring to general use a valuable preparation for which we have no exactly adequate substitute.

I am, gentlemen, very respectfully,

BENJ. CANAVAN.

699 *Broadway, N. Y.*, Aug. 31, 1849.

ART. LXX.—TINCTURA SAPONIS CAMPHORATA.

BY GEORGE ROSS, M. D.

VARIOUS suggestions have been given of late, as regards the best mode of making this preparation. I have met with the same difficulties, owing to its coagulation in cold weather, and hence, for some time past, have substituted the following, in lieu of the officinal preparation:

℞ Alcohol,	- - - -	O.v.
Castor oil,	- - -	℥iv.
Water of ammonia,	- -	℥iv.
Camphor,	- - -	℥iv.
Oil of rosemary,	- - -	℥j.

Mix the castor oil and water of ammonia together, then

add the alcohol; digest for twelve hours; then filter, and add the camphor and oil of rosemary.

The castor oil and ammonia make a soap soluble in alcohol. It forms a transparent liniment, yellowish in color, and will not coagulate in cold weather. And it always gives satisfaction to the consumers of it.*

REVIEW.

ART. LXXI.—CHEMICAL TECHNOLOGY OR CHEMISTRY APPLIED TO ARTS AND MANUFACTURES: By Dr. F. Knapp, Professor at the University of Giessen. Translated and edited with numerous notes and additions, by Dr. Edmund Ronalds, Lecturer on Chemistry at the Middlesex Hospital, and Dr. Thomas Richardson of New-Castle-on-Tyne. First American Edition, with notes and additions, by Professor Walter R. Johnson of Washington, D. C. Vol. 2d. Illustrated with 246 engravings on wood. Philada.: Lea & Blanchard, 1849. pp. 432.

In the Journal for October, 1848, will be found a notice of the first volume of this work, which has subsequently been completed by the issue of the second. In that notice the general scope and value of the work were pointed out, with a brief review of the several topics to which the volume was devoted. The present continues them, embracing the subjects of Glass making, Alum manufacture, Copperas manufacture, Clay wares, China ware manufacture, Stone ware manufacture, Bricks, Lime, Gypsum and Magnesia. Most of these subjects are of importance and interest to the pharmaceutist, and we conceive we shall be performing a useful task in presenting such information, derived from this work, as will aid and abet him in his profession.

* However good a preparation the above may be, it evidently should not be substituted for the officinal, when the latter is prescribed.—Ed.

With respect to the subject of glass, strong as may be the declaration of the author, yet all must at the present time be prepared to accord with it, and agree that "it is next to certain that the rapid development of those sciences which are based upon accurate observation and experiment, such as Astronomy, Natural Philosophy, Chemistry, and Physiology could never have taken place without the knowledge of glass and its applications."

The first part of the chapter upon glass, is devoted to the composition of this substance, after this follow the properties of the article and formulæ for making the different varieties. Glass is not a fixed substance, as by many imagined, but a chemical compound varying in ingredients and in the proportion of them; potassa, soda, lime, oxide of lead, iron, manganese, &c., as well as silica enter into the formation of the article, the properties of which must vary accordingly, or from the mode of treating the ingredients. As for pharmaceutical and chemical purposes, a glass is essential which will be least acted upon by the agents manipulated with, the importance of selecting the right kind, from a knowledge of the difference in varieties, becomes apparent. Our author states, that "under all circumstances, and when every precaution is taken in the manufacture, it is still impossible, as far as observation has shown, to obtain a glass which is practically incapable of being attacked."

"Pure, finely powdered glass taken from a tube or window pane and moistened with water, has been shown by Faraday and Bischoff to exhibit an alkaline reaction; sal-ammoniac precipitates flocculent silica from this solution, according to Fuchs. The same reaction occurs, according to Dumas, when water is boiled for some time in a glass vessel, and a troubled appearance arising from insoluble silicate of lime, is occasioned at the same time. Griffiths extracted 7 per cent. of potash from flint-glass powder, by boiling it for weeks together with water, and repeatedly

re-grinding and washing it. Hence it follows that ordinary glass cannot entirely withstand the action of water; although the influence exerted by this agent is comparatively unimportant and much less perceptible when the glass is not in the state of powder, and its natural surface is unimpaired. The best window panes, however, cannot altogether resist the action of the weather and the rain. The alkali is gradually extracted by atmospheric moisture and washed away, whilst a very thin layer of silica or of silicate of lime remains upon the surface, and exhibits a play of prismatic colors. The external coating, exhibiting the lustre of mother of pearl, with other relics of antiquity, was found by Griffiths to be pure silica. An observation of Colladon is very remarkable and difficult of explanation, who found pieces of glass taken from an old pit, 12 feet deep, both flexible and so soft that they could be kneaded and cut with a knife; glass of this kind, however, regained its hardness and frangibility by exposure for several hours to the air.

"Acids naturally extract potash, soda, and lime, with much greater ease from glass, with the separation of gelatinous silica. Caustic alkalies exert an opposite action upon glass by dissolving its silica. A like effect has been attributed to ammonia, and thence it has been explained, why the panes of glass in stables are particularly liable to become coated with a thin layer exhibiting the play of colors mentioned above. Glass which contains oxide of lead is liable to blacken on exposure to air containing sulphuretted hydrogen, by the formation of sulphuret of lead; and when heated in a flame, the oxide of lead is frequently reduced, and blackness is produced by the metallic lead.

"The action of hydro-fluoric acid, the most powerful agent for the decomposition of glass, is quite peculiar. Glass is completely disintegrated by this acid with the formation of fluosilicic acid and double compounds of fluoride of silicon with the fluorides of potassium, fluorides of sodium, and fluorides of calcium, &c."

White hohl-glass is the kind which has been designated sa *medicinal glass.* The following information will be nteresting.

White Hohl-Glass.

"*Composition.*—The following instances of composition may serve as general standards:

FOR APOTHECARIES' PHIALS.	SEMI WHITE.	CLEAR WHITE.
100 lbs. of white sand	100 lbs. sand	100 lbs. sand
30 — 35 " potashes (impure)	100 " crude soda containing lime	65 " calcined potashes
17 "	100 " cullet	6 " fallen lime
110 — 120 " ashes	½ — 1 " manganese.	100 " white cullet
½ — ½ " perox. manganese (cullet.)		½ " manganese.

BOHEMIAN CRYSTAL FOR GRINDING.		WHITE GLASS FOR CHEMICAL PURPOSES (*Solintass*)
100 lbs. white sand	100 lbs. sand	100 lbs white sand
0 — 60 " purified potashes	30 " potashes	41.4 " potashes
8 " chalk	18 " lime	17.5 " lime.
40 " broken glass	discolorising matters.	
½ " manganese.		

"These examples will suffice to show the general character of white hohl-glass, viz., that it is composed of purer materials, which are as free from iron and alumina as possible, with the use of discolorizing matters. A complete process of fining is always carried out, whatever may be the differences in the composition, rendered necessary by the various applications of the substance. Glass for chemical purposes must combine transparency and perfect absence of color, with the property of being difficultly decomposed, although this is of minor importance for other application s A few additional instances will prove that the working operations are essentially the same as those already described, and will show some of the expedients that are had recourse to under particular circumstances.

"*Mechanical Operations.*—One of the simplest cases is exhibited in the blowing of a flask, Fig. 22. According as the blast is kept up with more or less force during the swinging operation, the neck will be more extended or more cylindrical. Before blowing out the globe, the glass below is re-heated, but not that above, which is to form the neck; if the revolving motion is stopped, the pipe having a downward direction, before the globe is completely

formed, and the pipe is inverted into the position represented in Fig. 23, the belly sinks below the axis of the neck of the flask, and a retort is formed; no indentation occurs, as the constant blast keeps up the pressure of air in the interior.

Fig. 22. Fig. 23. Fig 24.

"When a hollow lump of glass, for instance a globe, is drawn out whilst hot, the cavity in the interior is always preserved, and even when the drawing process is carried to its utmost limits the thread of glass appears under the the microscope in the form of the finest capillary tube. Upon this depends the process of tube-drawing in the glass-houses, for which operation two workmen are required. Whilst one man collects the necessary quantity of glass on his pipe, and blows this out to a very massive globe, preserving a uniform thickness of the sides as much as possible, Fig. 24, the other attaches a drop of glass to a punty-rod, and warms it in the fire by the side of the globe. Both instruments are then removed from the fire at once, and the punty-rod is pushed forcibly against the globe in such a manner as to form exactly a straight line with the pipe

Fig. 25.

Fig. 26.

as represented in Fig. 25; this being accomplished, one of the workmen retires backwards as quickly as possible to the distance of 50, 60, or 100 feet. In this operation the

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17 "		100 "	cullet	6 "	fallen lime
110 — 120 "	ashes	¼ — 1 "	manganese.	100 "	white cullet
¼ — ½ "	perox. manganese (cullet.)			½ "	manganese.

BOHEMIAN CRYSTAL FOR GRINDING.				WHITE GLASS FOR CHEMICAL PURPOSES (*Selinlass*)	
100 lbs.	white sand	100 lbs.	sand	100 lbs	white sand
0 — 60 "	purified potashes	30 "	potashes	41.4 "	potashes
8 "	chalk	18 "	lime	17.5 "	lime.
40 "	broken glass	discolorizing matters.			
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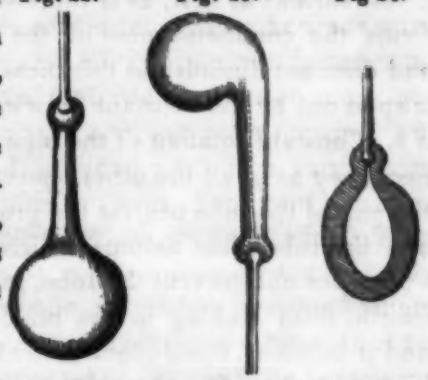
Fig. 22. Fig. 23. Fig 24.



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as represented in Fig. 25; this being accomplished, one of the workmen retires backwards as quickly as possible to the distance of 50, 60, or 100 feet. In this operation the

globe shrinks at first, as is represented at *a* in Fig. 26, and forms the commencement of the tube, which soon cools and does not diminish in thickness, whilst the mass of glass is spun out by the constant drawing from the warm end at *b b*. Constant rotation of the pipe and punty-rod is here as necessary as in all the other operations in glass blowing, or the part of the tube nearest the ground would cool quickest, and the tube thus assume an irregular form. This, however, does not prevent the tube, in consequence of its great length, from sinking in the middle like a stretched rope, and it becomes, consequently, thicker at the two ends, as is represented in Fig. 27. The curve in the tube is, however, remedied by placing it on the ground before it has become perfectly set, it then straightens, and is cut into lengths of 4 or 6 feet each, by taking hold of it with a pair of cold tongs. Tubes cool very uniformly, in consequence of their small amount of metal, and they are, therefore, not placed in the annealing oven. Lastly, the bore of the tube is dependent upon the length to which a given mass of glass is stretched, or the length being the same, upon the mass of glass. The stoutness of the tube is, however, determined by the thickness of the sides of the original globe, as the relation between the thickness of the sides and the bore is not altered by drawing. Wide, thin tubes (such as are used for spindles, &c.) must, therefore, be drawn out of a large thin globe, and *vice versâ:* it is necessary, however, whilst the tubes are drawing, to blow into them, that the sides may not sink in."

Fig. 27

As optical-glass is an exceedingly important variety of this substance, the account of its formation contained in this work will be found interesting. Besides its economical and scientific application, we are so much indebted to this article of manufacture for ornament and luxury, that in these points of view, it is of the highest importance. Curiosity will be amply re-

paid by perusing the pages which point out the various ways of producing those beautiful forms which adorn our houses, are produced at our entertainments, or, by every day use, contribute to our comfort.

The chapters on Alum and Copperas contain full information on preparing these substances important to the arts and manufactures; connected with the latter is the mode of producing the fuming oil of vitriol, which is pursued at Radnitz.

Porcelain is another subject important to the pharmaceutist this, with the various preparations from clay and bricks, constitute an interesting and full chapter.

The two concluding chapters are appropriated to lime and magnesia; connected with the latter are two substances used in medicine, the carbonate and sulphate. We take the liberty of inserting what the author says of the latter.

Sulphate of magnesia is procured from

"*Natural Solutions.*—This salt is found in sea water, in several salt springs, and even in ordinary wells. The oldest source whence it is procured is that of Epsom, in Surrey, from whence it acquired the name of 'Epsom Salts.' It also occurs in the springs at Saidschütz, in Bohemia, and as an efflorescence in many localities, termed Hair Salts by mineralogists.

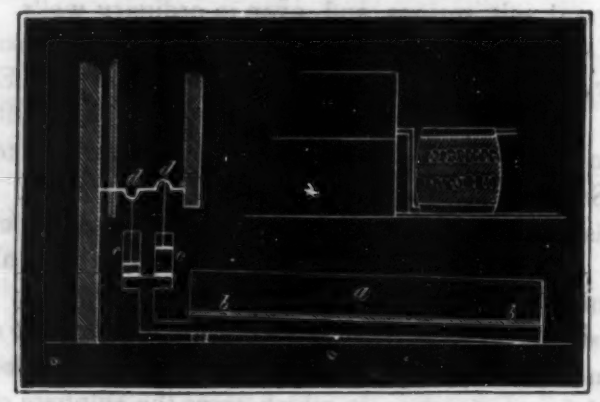
"It is procured from these bitter springs by simple evaporation and crystalization, but in such cases it is always contaminated with some chloride of magnesium. The same simple process is employed in some places to obtain it from the mother-ley after the common salt has been extracted from sea water, in which cases the sulphate of soda and chloride of magnesia are mutually decomposed, yielding common salt and sulphate of magnesia.

"*From Shale.*—It is also obtained in the neighborhood of Genoa from a shale containing magnesia, and the sulphurets of iron and copper. The shale is roasted and exposed to the action of the weather, which facilitates the oxidation of

the sulphurets. The magnesia abstracts a considerable portion of the sulphuric acid so formed, and the whole mass is then lixiviated. The copper is precipitated from the liquid by pieces of iron, and the iron is afterwards thrown down by the addition of milk of lime. The sulphate of magnesia is procured by boiling down the residual liquors and crystalization. The sulphate of magnesia obtained in this way is, however, never free from the sulphates of iron and copper.

"*From Magnesian Limestone.*—In this country, the sulphate is sometimes manufactured directly from magnesian limestone and sulphuric acid, in conjunction with other products. The carbonic acid produced by the action of the sulphuric acid is employed in the manufacture of bicarbonate of soda, already described at p. 296, vol. i., while the mixed sulphates of lime and magnesia are thrown into large wooden vessels *A*, Fig. 244, which are fitted with a

Fig. 244.



false bottom *b b*. Water is now poured upon the thick mass and drawn through by the action of a pair of pumps *c c*, worked from an engine shaft in any convenient manner, as shown at *d d*. In this way, the whole of the sulphate of magnesia is extracted with the least expenditure of water; and the solution, after being pumped into a reser-

voir, is allowed to filter through layers of sandstone and charcoal to render it clear and bright, as shown in the sketch, Fig. 244, at *B*. The solution is now concentrated by evaporation, and made to crystalize as rapidly as possible, in shallow wooden tronghs lined with lead, in order that the crystals may be as small as possible to meet the prejndice of the trade in this respect. The sulphate of lime left on the filter or false bottom *b b*, is worked up in the manufacture of Venetian red.

"The process, however, which is more generally pursued is as follows:

"Magnesian limestone is calcined in an ordinary lime-kiln, and repeatedly washed with water to remove as much of the lime as possible. The extent to which this is carried may be inferred from the following analyses of a sample of limestone in its natural state, and after it had been calcined and washed:

Natural.		*Washed.*	
Carbonic acid, &c. -	47.12	Water, &c. - - -	32.54
Lime - - - - -	27.49	Lime - - - -	7.34
Magnesia - - -	22.22	Magnesia - - -	44.41
Insoluble matter, alumina, &c.	3.17	Insoluble matter, alumina, &c.	15.74
	100.00		100.00

(Richardson.)

"The limestone selected by the manufacturer for this purpose is soft, and similar to that known as *flexible;* such samples as have the appearance shown in the sketch (Fig. 245) do not usually contain so much magnesia.

Fig. 245.

"*From refuse Alum-liquors.*—In the manufacture of alum as conducted near Whitly, the "salts'-mothers" contain in the gallon:

Sulphuric acid (free - - -	2697.61
Sulphate of magnesia - - -	8910.40
Sulphate of alumina - - -	852.24
Sulphate of potash - - -	3693.32
Sulphate of manganese - - -	106.60
Sulphate of nickel and cobalt -	traces
Sulphate of iron - - -	3026.67
	grs. 19286.30 (Richardson)

which by crystalization produces a crude sulphate of magnesia, called "Rough Epsoms," which has the following composition:

Sulphuric acid - - - -	32.26
Magnesia - - - -	15.35
Protoxide of iron - - - -	1.73
Oxides of nickel and cobalt - -	0.12
Lime - - - -	0.09
Alumina - - - -	1.33
Potash - - - -	0.83
Water - - - -	48.29
	100.00 (Richardson.)

These rough Epsoms are mixed with the washed magnesian lime in such proportions that all the sulphuric acid, except that in combination with the potash and magnesia, is taken up by the free magnesia and lime. The mixture is then calcined in an ordinary reverberatory furnace, at a dull red heat, which assists the transfer of the sulphuric acid, and raises the metals to a higher degree of oxidation, thereby ensuring their insolubility. The calcined product is afterwards thrown into a large circular cistern *a*, Fig. 246, filled

Fig. 246.

with water, and in which a pair of edge-stones *b b*, is made to revolve by suitable machinery *c c*. By this arrangement, the large pieces are ground to powder, while the agitation produced by the motion of the edge-stones facilitates the solution of the sulphate of magnesia.

"The sulphate of magnesia liquor is subsequently clarified in the manner previously described, and crystalized in the usual shallow pans. When the liquid has drained off from the crystals, they are removed to a stone and dried at a low temperature. In this dry state, they are thrown into a species of temse, which reduces still further the size of the crystals, and renders the whole of a more uniform appearance.

"*From Bicarbonate of Magnesia.*—Mr. Pattinson has also patented the application of his bicarbonate of magnesia solution for the production of sulphate of magnesia, which he effects by employing either sulphuric acid or its equivalent quantity of sulphate of iron, heating to the boiling point, and separating, in the latter case, the precipitated carbonate of iron by subsidence, and then crystalizing.

"*From native Carbonate of Magnesia.*—Mr. Chance has lately imported a very pure, natural carbonate of magnesia from the Mediterranean, to which he adds sulphuric acid, and proceeds in the usual way for the production of this sulphate; and having, it is understood, secured the entire produce of the mine, he is likely to become a formidable competitor to the other manufacturers.

"Another article is manufactured to some extent which requires a passing notice here, viz., what are termed "Mock Epsoms," which is simple sulphate of soda crystalized very rapidly in shallow vessels for the purpose of adulterating the genuine article.

"The sulphate of magnesia crystalizes in right prisms, which at 60° Fahr. are soluble in their own weight of water. When exposed to the air, they effloresce and are reduced to powder. This salt has the well-known intensely bitter taste; and is composed of

Magnesia - - -	16.26
Sulphuric acid - -	32.52
Water - - -	51.22
	100.00"

In concluding our notice of this work we cannot avoid noticing the beautiful manner in which it has been gotten up. The new style of wood engravings are peculiarly adapted to set off the pages, and by their clearness to illustrate the processes described. To the practical man in the various departments of arts described by it, the work cannot prove otherwise than useful.

ART. LXXII.—CHEMICAL FACTS APPLIED TO PHYSIOLOGY.

By M. Barreswil.

The following are the conclusions arrived at by the author:

1. That the white of the egg of the common fowl contains sugar.

2. That the white of egg is alkaline, and that its alkalinity depends upon carbonate of soda.

3. The yolk of egg contain little or no alkali; its emulsive properties in all cases depend, not upon the alkali, but upon a product analogous to that existing in the pancreatic juice.

4. The yolk of egg is not acid, but becomes so in consequence of having undergone a change.

5. The acid reaction and the properties of the gastric juice are produced by organic acids, and not muriatic acid.

6. The alkali and sugar of the white of egg may disappear, mutually destroying each other, even during the experiment made for their demonstration; and thus the discrepancy in the results obtained by the difference of the methods may be explained.

7. The change in the albumen of the egg, and in all analogous matters, is more rapid in proportion to the dilution of these matters; and the cause of the greater or less rapidity in the change is owing (all other conditions being the same) to the circumstances which favor more or less the solution of the ferment.—*Chem. Gaz., from Comptes Rendus.*

ART. LXXIII.—ON HYDRATED VALERIANATE OF ZINC.

By G. C. Wittstein.

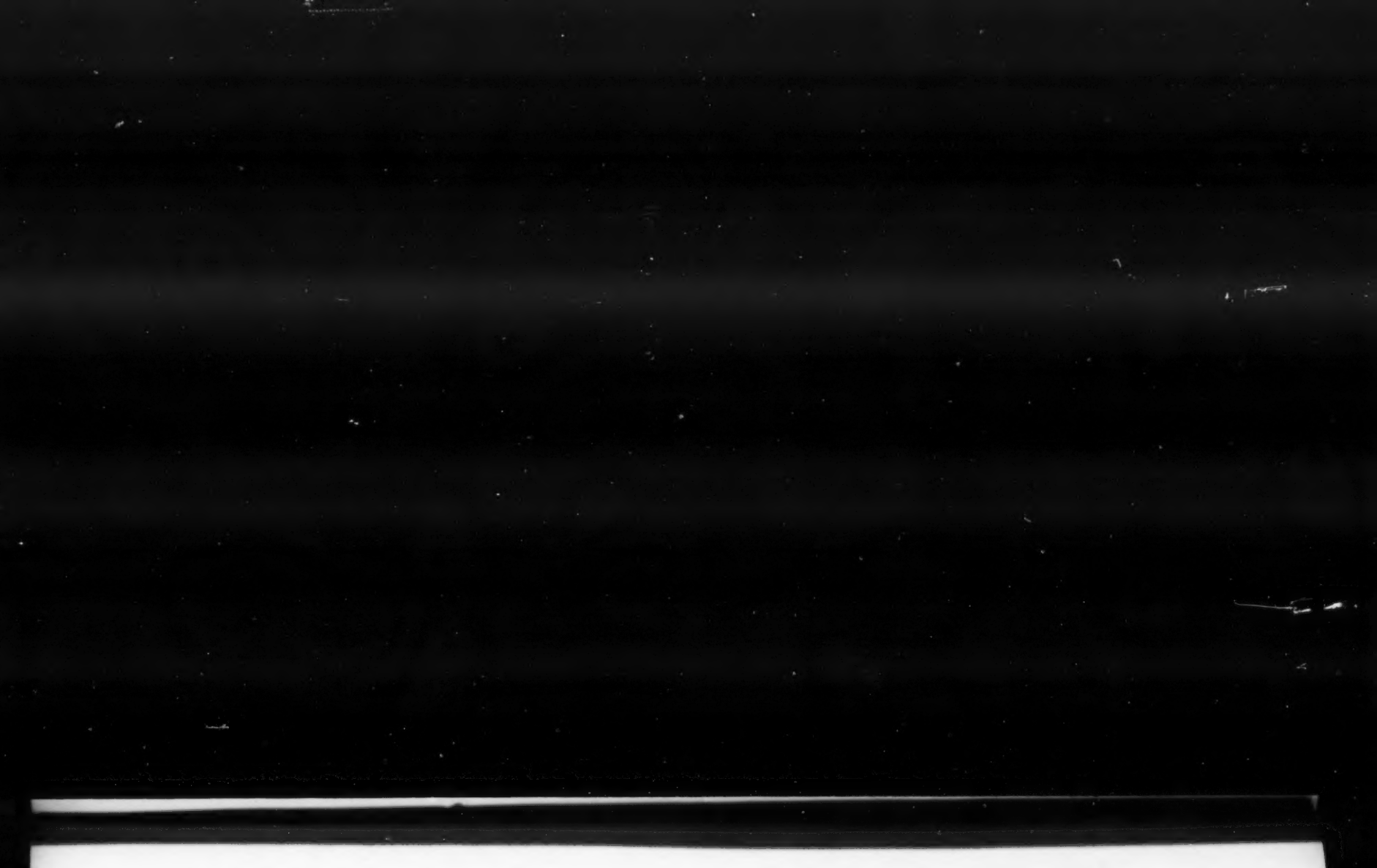
The valerianate of zinc, obtained by precipitating sulphate of zinc with valerianate of soda, or by evaporating the aqueous solution, is anhydrous. If, on the contrary, carbonate of zinc is stirred with so little water as to form a paste, it is converted, upon the addition of the calculated quantity of valerianic acid, into a hydrated salt with 12 atoms of water. This salt, when dried at 122°, perfectly resembles the anhydrous salt. It parts with its water at 212°, and dissolves in 44 parts of water. The solution, on being heated, becomes turbid, but bright again on cooling. When boiled so long that the whole of the sediment does not redissolve on cooling, the residue is the anhydrous salt. The analysis of the hydrated salt dried at 122° furnished—

Oxide of zinc	17·00	1	16·94
Valerianic acid	38·58	1	38·42
Water	44·42	12	44·64

Ibid, from Buchner's *Rep.*

ART. LXXIV.—METHOD OF SOLDERING CAST IRON WITH WROUGHT IRON.

The following process has been recommended for this purpose:—First melt filings of soft cast iron with calcined borax in a crucible; then pulverize the black vitreous substance which is thereby produced, and sprinkle it over the parts which are intended to be united; after which heat the pieces of wrought and cast iron and weld them together on an anvil, using only gentle blows. This method is peculiarly applicable for the manufacture of iron articles which are intended to be made red hot, and are required to be impervious to fluids and liquids, as such a result cannot be obtained by simple fastening.—*Newton's Journal.*



ART. LXXV.—SOME OBSERVATIONS ON CHLOROFORM.

By Messrs. Soubeiran and Mialhe.

Two liquids are sold in commerce under the name of chloroform, which, although of very different origin, have nevertheless been hitherto considered as identical, and substituted one for the other. However, they exhibit some remarkable differences in their properties; the one derived from the action of hypochlorite of lime upon alcohol possesses all the characters which have been assigned by one of us to chloroform, and which we shall therefore call *normal chloroform;* the other, obtained by the action of hypochlorite of lime on pyroxylic spirit or methylic alcohol, differs so much from the first that we were induced to submit them to a careful comparative examination to ascertain the cause of this difference.

The chloroform from pyroxylic spirit, which we shall call for convenience *methylic chloroform*, although possessing the same physical appearances as the normal chloroform, has quite a different odor; it is not sweet and agreeable, but empyreumatic and nauseous. Its density is less than that of ordinary chloroform; the latter weighs 1·496, whilst the specific gravity of the former is only 1·413.* Its boiling-point likewise appears to be lower; and lastly, the inhalation of the methylic chloroform, far from being agreeable and pleasant, produces a general feeling of sickness, followed by a heaviness in the head, and sometimes by vomiting.

These differences led us to believe that they did not possess the same composition, or that the properties of one of

* We may observe that the density of chloroform, fixed by M. Liebig at 1·480, is too low; we have constantly obtained 1·496 at 54° for a perfectly pure chloroform. This difference undoubtedly arises from the presence of a foreign substance which had not been separated from the chloroform, as we shall presently show.

them were masked by some foreign substance. On the first hypothesis, it might be imagined that the chloroform, which does not belong to the same chemical type as alcohol, and which is produced by the profound disturbance caused by the action of chloride of lime, might prove to be a different substance according as it resulted from the action upon alcohol, which belongs to the ethylic series, or from the reaction on wood-spirit, which belongs to the methylic series. It might also happen that the difference was owing to a weaker or stronger condensation of the methyle, supposed to exist equally in the two chloroforms. To decide this, we undertook some analyses, the result of which will be given subsequently. The second hypothesis supposes the identity of the chloroform, whether it has been formed from alcohol or from pyroxylic spirit; the difference in this case would arise from the presence of a foreign substance. This opinion is better founded; in fact, on attempting to rectify methylic chloroform by successive distillations over chloride of calcium, we found that the salt forming the residue retained after each distillation a certain quantity of a peculiar oil, which was easily isolated by washing with water. By repeated rectification, we were able to obtain a considerable amount of this oil, the proportion of which rose to as much as 30 grms. in 500 in some commercial chloroforms.

This new substance is liquid and of an oily consistence. At first yellowish, it is rendered colorless by a simple rectification; it has a very peculiar and very strong empyreumatic odor, similar to that possessed by the methylic chloroform; it is lighter than water; it began to distil at 185°, but gradually rose to 271°. This rise of temperature during the distillation evidently indicates a mixture of different compounds. It readily took fire, and burnt with a very intensely smoky flame. The presence of chlorine among the products of its combustion, indicated that this body formed a constituent part.

Although rectified several times, the chloroform which had yielded this oil still retained the characteristic empyreumatic odor. We therefore sought for some chemical reagent, which, without acting upon the chloroform itself, should either separate or destroy the oil it still contained. After some experiments, concentrated sulphuric acid appeared to us most suitable; it produced in the impure chloroform a brownish-red color, which was the more intense the more oil was contained in the mixture. This color, which it likewise produces in a far higher degree with the isolated oil, is due to its carbonization; so that on distilling impure chloroform with a certain quantity of concentrated acid, we succeeded in obtaining a product which was no longer colored by this powerful reagent, and possessed no empyreumatic odor.

We were then able to analyse the chloroform thus purified, and to examine its properties compared with those of normal chloroform. Composition, boiling-point, density in the liquid state and in the state of vapor, were all found to be perfectly alike; and we were able to assure ourselves that there exists but one chloroform, and that that derived from wood-spirit does not differ in the least from the chloroform from alcohol when the precaution has been taken to separate the whole of the oil above-mentioned. However it must be stated that the complete separation of this oil was not effected; there still remained a minute proportion, so small indeed as to have no influence either on the specific gravity or on the results of the analysis; but it was evident, from the odor which remained after evaporating a sufficiently large quantity of chloroform; and likewise the vessel used to take the density of the vapor, still perceptibly retained the peculiar odor of this chlorinated methylic oil. It is almost impossible to remove the last traces of it; they resist the action of concentrated sulphuric acid even after long-continued contact.

There are therefore not two kinds of chloroform; but the presence of a peculiar oil, produced in the action of chloride of lime upon pyroxylic spirit, is the cause of the differences which they present at first sight. Having established this fact, we now enquired whether during the preparation of chloroform from alcohol a substance analogous to that just described was not produced. Our suppositions were confirmed by experiment. The crude chloroform was first washed with water, then with carbonate of soda, left for a long time with chloride of calcium to remove the water; and lastly, filtered and distilled in a glass retort in a water-bath. There remained in the retort an aromatic liquid, but of an odor different from that of chloroform; but the amount was very small, being not 40 grms. from 20 kilogrammes of chloroform.

This oil differs essentially from that obtained from the chloroform prepared with pyroxylic spirit; it is heavier than water, and has a peculiar acrid penetrating odor, totally different from that of the other. On attempting to determine its boiling-point, we found that, like the former, it consisted of a mixture of different compounds; for the thermometer, which stood at 154° at the commencement of the ebullition, rose to 243°, and the temperature would undoubtedly have risen still higher had a larger amount been at our disposal. All these compounds contain chlorine, as was evident from an examination of the products of their combustion. Although these different substances were not submitted to analysis, everything leads us to believe that they are intermediate in composition between chloroform and one of the known chlorides of carbon.

It is scarcely possible to decide by what reaction these chlorinated oils are produced, no organic analysis having been made; we may however observe, that in the preparation of chloroform from ordinary alcohol, the more chlorinated oil is formed the less chloride of lime is added to

the mixture, or that the production of the substance is due to an excess of chlorine.

It results from what precedes, that the chloroform obtained from wood-spirit should not be employed for inhalation, it being impossible to deprive it entirely of its empyreumatic odor; it might be used for liniments, after having been previously rectified over sulphuric acid and chloride of calcium; but the necessity of these rectifications destroys the advantage which might arise from the substitution of pyroxylic spirit for alcohol.

The presence of the chlorinated oil, however small in quantity, even in the chloroform obtained from alcohol, has a very decided influence on the use of this substance. It is to it that must be most frequently attributed the sickness and vomitings caused by the inhalation of chloroform. It is therefore absolutely requisite to distil the chloroform, in order to separate the foreign substance which it contains; and this distillation should be stopped shortly before the end of the operation, in order not to re-form the mixture. The oil contained in the residue then possesses in the highest degree the property of producing headache and giddiness; its action upon the system certainly requires that its physiological effects should be studied.

In conclusion, we may draw attention to a physical property of chloroform, which appears not to have been previously noticed; it is its solidification by spontaneous evaporation. When chloroform is poured upon a double filter of bibulous paper, a great portion of the liquid, from its heaviness and fluidity, quickly passes through the paper; whilst another portion, evaporating rapidly upon the margins of the filter, produces so much cold as to congeal it into white silky scales, which keep a few instants.—*Chem. Gaz. from Journ. de Pharm.*

ART. LXXVI.—MEANS OF DETERMINING THE PURITY OF THE OTTO OF ROSES.

By M. Guibourt.

The high price of this article renders it a matter of great importance to be enabled to decide upon its purity. The following means, if used in combination, will leave no doubt upon this point.

The physical characters can be but little depended upon; thus, the yellow color with a tinge of green and its point of congelation may be readily imitated. Its odor also is so powerful, that a certain quantity of any other oil of a somewhat similar odor might be added without sensibly diminishing that of the otto. The manner in which it crystallizes is of a certain amount of importance. When, after having been liquefied by a gentle heat, it is allowed to cool slowly and at rest, it remains as it were transparent, in consequence of the thinness and the perfect transparence of its long and pointed crystals, which resemble the blades of daggers; and on varying their position as regards the light, these laminæ reflect all the prismatic colors. When the otto of roses has been adulterated with any uncrystallizable oil, which requires that its property of congealing should be imparted by the addition of spermaceti, it presents, when solidified, a number of fine needles, which, however, are not transparent, but render the mass uniformly semi-opake. But for this test to be of any value, the otto must be allowed to crystallize slowly and at rest; otherwise it becomes nebulous and opake, like that which has been adulterated.

The oil most frequently used for its adulteration is that of several species of *Pelargonium*. The oils derived from the different species cannot be all identical, since M. Recluz has described one which is solid, whilst that which is met with in commerce is always liquid. The oil which I em-

ployed for comparison is called oil of *Geranium*, and came from Nice. I also examined some oil of rose-wood, which was distilled at Paris some years ago, and some of that found in commerce. Three re-agents will serve to distinguish the pure otto—iodine, nitrous acid vapor, and sulphuric acid.

Test with Iodine.—A small quantity of iodine is placed in a small glass vessel with a wide mouth; around it watch-glasses are arranged, each containing one or two drops of the oils under examination, and the whole is covered with a bell-glass. At the end of a few hours the vapor of the iodine is found to have condensed upon every part of the interior of the bell-glass, and upon the glasses containing the oils; but the margin of the watch-glasses containing the substituted oils is much more colored than that of the glass containing the otto; and when the former oils become brown, the latter retains its natural color. After some hours the vessel containing the iodine may be removed; and then, the effect still continuing, the otto remains white, whilst the other oils become perfectly black. On exposing the watch-glasses to the air, the iodine which has condensed upon the margin of those containing the otto is volatilized, and the glass becomes almost colorless, whilst the others retain their black color. I am satisfied that this test will serve, not only to determine the nature of the otto of roses, but also whether any oil of geranium or rose-wood is present in it or not.

Nitrous Acid Test.—For this I use a small glass vessel, placed upon a plate. 10 or 15 grms. of concentrated nitric acid are placed in it, and some copper turnings added. Around this, watch-glasses are placed, containing one, or *at the most*, two drops of the oils, and the whole is covered with a flat bell-glass. In a few minutes the oil of rose-wood acquires a dark-yellow color; the otto acquires nearly

the same color; whilst the oil of geranium becomes of an apple-green color, and retains it for some time.

This test will serve to distinguish the two oils when in a state of purity, and may even serve to recognise oil of geranium containing the otto, because of the yellow color which it imparts to the latter; but it is evident that it cannot serve to determine the presence of the oil of geranium in the otto of roses.

Sulphuric Acid Test.—One or two drops of the oil to be tested is put into a watch-glass; the same number of drops of very concentrated sulphuric acid are added, and the two fluids mixed with a glass rod. All the oils are rendered more or less brown by this proceeding; but—

The otto of roses retains the purity of its odor.

The oil of geranium acquires a strong and disagreeable odor, which is perfectly characteristic.

The odor of the oil of rose-wood is increased, and becomes somewhat unctuous. It is not, however, characteristic.

The commercial oil of rose-wood acquires an odor distinctly like that of cubebs.

Of these three methods, that with sulphuric acid is by far the best for distinguishing the otto of roses from the oil of geranium, and for the recognition of the second in the former. The iodine-test is also very certain, but it requires considerably more time. The nitrous acid test will serve to recognise the two oils when not mixed, or even to detect the otto of roses in the oil of geranium; but not the latter when mixed with the former.—*Ib., from Jour. de Pharm.*

ART. LXXVII.—ON THE PURIFICATION OF GUM ARABIC.

By H. Picciotto, Esq.

It is known that gum arabic, of whatever quality, or from whatever country imported, contains, besides the pure mucilaginous substance called by some chemists, "Arabine," and which in all the different varieties is essentially the same—also more or less of all the following impurities, viz., ligneous and other insoluble fibre, sand and other earthy substances and coloring matter; moreover some varieties of gum arabic contain also a portion of that species called "Bassorine," which is insoluble in cold or hot water. These impurities necessarily interfere more or less with the good results expected in the various uses of gum Arabic, and the dark colored sorts are totally unfit for many uses. The object of the invention to be noticed in this paper is to separate all those extraneous matters from the gum, and by thus decolorizing and purifying it, render it finer, more useful, and better available for both pharmaceutical and manufacturing purposes. This object is effected by the following process, which, after a long series of experiments and researches, conducted during the period of four years, I have found to be the best on all accounts.

Having prepared a strong and purified solution of sulphurous acid gas, I introduce into it some gum, in the proportion of one of the latter to about six or eight of the former; the mixture is kept protected from the contact of the air, and when the gum is dissolved, it is found that a l or most of the coloring matter has combined with the acid, and the other impurities have precipitated. Heat is now applied to the vessel, and the warm liquid is run off into a large receiver containing a quantity of carbonate o baryta in excess. Immediately a combination takes place, forming a perfectly insoluble sulphite of baryta, to which the coloring

matter remains united, carbonic acid gas is evolved, and the liquid remains nearly colorless. Then it is filtered through some very close filters, such as would not allow the passage of any particle of solid matter, and thereby a pure, limpid, and tasteless solution of gum is obtained. Sometimes the whole of the coloring matter has not been removed, and a repetition of the process is necessary to obtain a perfect whiteness. The purified filtered solution is then concentrated by evaporation at a moderate temperature, and reduced to any required degree of density, or to complete dryness. I have constantly found that none of the physical and chemical properties of the gum thus operated upon are in any way affected.

There is also another method of separating the acid from the gum in solution, equally effective, but a small portion of coloring matter remains in the gum; it is by boiling the mixture in vacuum at a temperature under 120° Fahr. The gas which is volatilized may be absorbed by charcoal placed in the receiver, or may be conducted through a pump into another receiver containing water. The solution of gum, when the process is finished, remains free from acid, if during the whole operation it has been well protected from contact with the atmospheric air.

The process described may be varied in its details, but its principles remain essentially the same; and the gum obtained, after filtration, is not found to contain the slightest particle of any of the ingredients used, and is undoubtedly *purer* and *whiter* than the finest sample of the picked white Turkey gum.

Now, I may be allowed to add a few remarks, considering the matter in a commercial point of view. At present, the white gum Arabic is a scanty product of nature; we are dependent for its supply upon the one country, (Egypt,) which alone produces the article; frequently French or Austrian merchants established at Alexandria make a mono-

poly of it, and whatever portion is imported into this country must pass through their hands. Hence its price is high, and its uses are rather restricted. Were the supply more abundant, and the cost price somewhat more moderate, the consumption would increase enormously, for there are several trades in which white gum Arabic would be used very largely, and with great advantage to the articles produced, instead of various substitutes now in use, all of which are wanting either in the brilliancy of the gum, or in some other of its useful properties. Of this I have the direct testimony of manufacturers, especially in the silk trade. The employment of the purified gum will assuredly improve the products of several British manufactures of considerable importance. In other respects also the general introduction of this article will be beneficial to English commerce. It will render us independent of the monopoly carried on by foreign merchants in Egypt; and it will give an increased value and importance to the produce of British possessions and colonies, such as East India, Australia, Cape of Good Hope, &c., by rendering the sorts of gum Arabic imported from those countries available for purposes to which they could never hitherto be applied.—*Pharm Journ.*

ART. LXXVIII.—SPURIOUS CHEMICALS.

By Jacob Bell, Editor of the Pharmaceutical Journal.

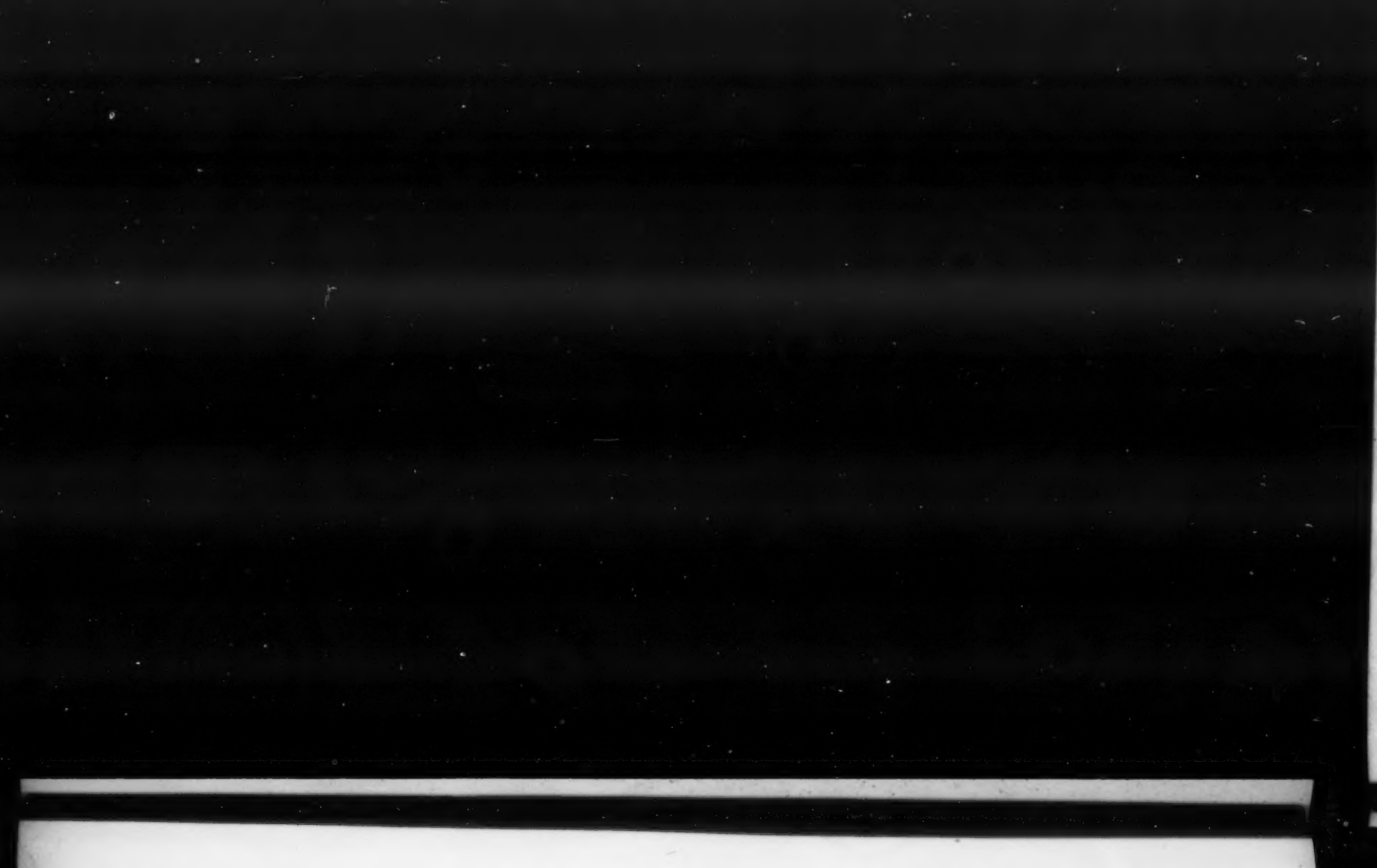
We have repeatedly had occasion to direct the attention of the readers of this Journal to the adulteration of drugs. It is now our duty to notice a system, which appears to have prevailed to a considerable extent, not of adulteration, but of the wholesale substitution of comparatively worthless compounds, for valuable and powerful medicinal

agents. Within the last few years compounds of valerianic acid with oxide of iron, with oxide of zinc, and with quina, have been introduced into medicinal practice as efficacious remedies, especially in hysteria, and other affections of the nervous and uterine system, and in fevers. A good deal of attention has been devoted by practical Chemists to the preparation of these valerianates, and several processes for making them have been published in this and other Journals. The valerianates, however, have always, and necessarily, been expensive preparations, yet the use of them has been gradually extended in consequence of the testimony borne to their great efficacy. Increased demand led to competition in the supply, which has recently resulted in the adoption, by some manufacturers, of a system of substitutions that would have speedily brought a valuable set of remedies into disrepute, had not the fraudulent practice been detected.

Citrate and tartrate of iron, flavored with a few drops of oil of valerian, has been extensively supplied for valerianate of iron; and acetate of zinc, flavored in the same way, has been substituted for valerianate of zinc; and these spurious compounds have been sold at prices which, although defying competition on the part of the genuine valerianates, have nevertheless been twenty or thirty times greater than the commercial value of the substituted articles. For valerianate of quina the disulphate of that base, with a little oil of valerian to disguise it, has been in like manner substituted.

Thus compounds have been supplied for the three medicinal valerianates, which have not contained a particle of the most important of the constituents which should have been present, namely, the valerianic acid.

Such being the nature of the frauds which have been practised, we have no doubt, upon many of our readers, we proceed to point out the means of detecting them.



1. *The true valerianates* have a sour, disagreeable, and very persistent, although not powerful smell, which is essentially different from that of oil of valerian.

1. *The spurious imitations*, being flavored with oil of valerian, smell strongly of that substance.

2. *The true valerianate of iron* is almost entirely insoluble in water; and the valerianate of quina fuses into oily globules in boiling water, and dissolves with difficulty. They are both soluble in spirit.

2. *The spurious valerianate of iron* is perfectly soluble in water, especially when aided with a little heat; it is insoluble in spirit. *The spurious valerianate of quina* is soluble in about thirty parts of boiling water, and, as the solution cools, it is deposited in acicular crystals, which have the bitter taste and other characters of disulphate of quina.

3. *The true valerianates*, when mixed with a little diluted hydrochloric acid, are decomposed, and the valerianic acid being set free, rises like oil to the surface of the liquid. To get this character it is necessary to operate upon from five to ten grains of the specimen, and to avoid the use of too much of the diluted acid, as valerianic acid is soluble in about thirty parts of water. The liberated valerianic acid has the sour, disagreeable, and very persistent smell,

3. *The spurious valerianates*, when added to water, will generally yield a thin film of oil, which floats on the surface, and is easily detected as oil of valerian. On heating the liquid this oil is driven off, without otherwise decomposing the salt, and no further indication of valerian will afterwards be obtained. On treating them with diluted hydrochloric acid there is no valerianic acid set free.

which to a slight extent is perceived in its salts, but it is readily distinguished from that of oil of valerian.

4. *The true valerianates*, when mixed with a little proof spirit, and one-fourth the volume of oil of vitriol is then carefully added, will yield valerianic ether, which is recognised by its agreeable fruity smell, somewhat resembling that of the pine-apple. This ether can hardly be distinguished in smell from butyric ether.

4. *The spurious valerianates* yield no valerianic ether; but the *spurious valerianate of zinc*, when treated as above, yields acetic ether, which is easily detected.

The foregoing tests are sufficient to distinguish the true valerianates from the spurious substitutes above mentioned, but there is reason to believe that other substitutions have been practised, although not so extensively. We have met with a specimen of so-called valerianate of iron, which is evidently not what its name indicates, and yet it contains neither citrate, tartrate, nor acetate. It is in the form of a brown powder, insoluble in water and in spirit. It smells of valerianic acid, but on being decomposed with hydrochloric or sulphuric acid, yields no appreciable quantity of the oily product. We have not had time to submit this specimen to a careful examination, but it is easily distinguished from the true valerianate of iron, by its being insoluble in spirit, while the latter dissolves freely in this menstruum, even without the application of heat. This suspected specimen is also distinguished from the genuine by its behaviour when heated in a platinum crucible.

The true valerianate, if carefully heated, fuses, gives off valerianic acid undecom-

The suspected specimen does not fuse or give off any appreciable quantity of vale-

posed, then as the heat is increased, burns with a luminous flame, and emits a very offensive odor.

rianic acid. The vapor does not readily inflame, and the odor emitted is not offensive.

The residue of oxide of iron is the same in both specimens, namely, twenty-five per cent., and the acid originally present is organic.

Where mere adulteration is practised, the detection of the fraud is much more difficult than it is in the cases to which we have hitherto alluded, the cupidity of the manufacturer having fortunately, in these cases, blinded his discretion, so that a speedy exposure of the practice was inevitable.

About three years ago, as we find from the *Journal de Pharmacie*, much of the valerianate of zinc met with in Paris, was found to have been made with butyric acid, instead of valerianic acid. The butyrate thus substituted was of a more beautiful and crystalline appearance than the true valerianate, but it did not essentially differ in character, and the detection of the fraud, by satisfactory tests, was not easily accomplished. A paper was published on the subject by Messrs. Laroque and Huraut, in which they recommend the use of a concentrated solution of acetate of copper for distinguishing valerianic from butyric acid. In the use of this test, however, it is necessary, in the first place, to eliminate the acid by adding sulphuric acid to the salt and separating the volatile acid by distillation. When butyric acid is added to the concentrated solution of acetate of copper, a blueish white precipitate is immediately formed; but on adding valerianic acid in like manner, there is no immediate appearance of precipitation or turbidity of the liquid, but on shaking it, oily drops of a greenish color, separate, partly rising to the surface and adhering to the sides of the vessel, and partly falling to the bottom. These oily globules consist of anhydrous valerianate of copper, which retains this condition sometimes for twenty minutes or more, but it ultimately becomes hydrated, and then forms a blueish green crystalline powder.

The greatest possible vigilance and care are requisite on the part of those supplying compounds, such as we are here noticing, for medicinal use. Some of these compounds have been but little studied by Chemists, and the means of distinguishing them by chemical tests is not always complete or satisfactory. If manufacturers are disposed to be dishonest, it is sometimes difficult to detect all their fraudulent practices; and a single individual may thus entail discredit upon hundreds of unconscious dupes, who become the venders or dispensers of spurious or sophisticated articles. The injury thus inflicted on medical science is of a very serious nature, for what becomes of the value of medical experience with reference to the action of remedies, if no dependence can be placed upon their identity? A physician sees an account of the great benefits which have been derived from the administration of valerianate of zinc or iron in some very troublesome complaints. He prescribes the remedy, but after a lengthened trial finds it to be unavailing, and accordingly he discards it from his Materia Medica, unless, perchance, as in the present instance, it is discovered that the remedy employed was entirely different from that prescribed, and then the dispenser and the wholesale vender are alike involved in the mortification and disgrace of having obstructed the efforts of science to relieve the sufferings of the afflicted. Is it not too often the case that the skill and learning of the physician are stultified by practices such as it has now been our painful duty to record and to reprobate?

It was but the other day that a case came within our knowledge in which a medical man, being desirous of trying the action of different anæsthetic agents, made a series of experiments with *Dutch liquid*. Having complained of the price charged for the first specimen which he obtained, further supplies were procured from a different source; but after devoting much time to the investigation of the medicinal action of the remedy, with the intention of publishing

the results, what must have been his mortification to find that the substance he had used was not Dutch liquid at all, but appeared to be a mixture of chloroform and spirit! The physical characters of chloroform and Dutch liquid are so similar that they cannot be distinguished by taste, smell, or general appearance; and the addition of a little spirit to chloroform, gives to the latter the property of burning, and reduces its specific gravity, so as to assimilate in these respects with Dutch liquid. The fraud was ultimately detected in the case alluded to by mixing some of the spurious article with water, when the spirit was separated, reducing the volume of the liquid to one-half, and this was found to be no longer combustible.

The practice of medicine is either based upon principles which have been established by the careful observation of the action of remedial agents, or it is a system of quackery and deception Yet it is obvious that all observations must be worse than worthless, and that no step can be taken in the advancement of the science of medicine as a remedial art, unless well defined agents be employed, and their identity be constantly maintained. How great, then, is the responsibility of the dispenser of medicines! How greatly is the physician dependent upon his intelligence, integrity, and skill!—and how much does it behove the public to require that those who are engaged in the administration of medicine shall be competent for the performance of their responsible duties!—*Pharm. Jour.*

ART. LXXIX.—ON SOME USEFUL PROPERTIES OF BENZOLE, AND ON A PRACTICAL MODE OF PREPARING IT.

By Charles Blachford Mansfield, B. A.

Benzole dissolves many substances with extreme readiness and in large quantities, such as many resins, mastic, camphor, wax, fatty and essential oils, caoutchouc and

gutta percha. Its volatility gives to its solution of either of the two latter substances the useful property of drying rapidly and perfectly; so that, when spread on glass or any polished surface, a film of the gum is deposited, which may readily be peeled off in the form of a tough membrane of any required degree of tenuity, and possessing all the properties of the original material. The same solutions, varnished on the skin, form admirable artificial cuticles, which have been found useful in cases of wounds and burns, and might probably be very beneficial in some skin diseases.

It dissolves gamboge in smaller quantity, and shell-lac even more sparingly; but it will mix in equal bulks with a saturated solution of lac in wood-spirit or alcohol. This property may be valuable to varnish-makers.

Copal and animè yield but slightly to the solvent power of this fluid; but its vapor, in the act of condensation, rapidly dissolves these resins; so, that, if fragments of them be suspended in the head of a vessel in which the hydrocarbon is boiling, the vapor, as it condenses on their surfaces, softens and dissolves them, and trickles back into the vessel below, in which a colorless varnish will result, more or less concentrated according to the duration of the process.

Benzole dissolves quinine, depositing it on evaporation in a crystalline form; the condensing vapor dissolves the alkaloid, especially if not recently precipitated, more readily than the boiling liquid. Cinchonine it does not dissolve, but forms with it a bulky gelatinous mass. It dissolves strychnine and morphine but sparingly.

It dissolves iodine, phosphorus and sulphur; and when boiling takes up the latter in large quantity, of which, however, the greater part crystallizes out as the fluid cools.

It has been found extremely useful in the laboratory as a solvent in researches in organic chemistry, where the high price and almost too great volatility of ether render a substitute for that agent a frequent desideratum.

It has an interest, too, as offering a cheap and ready source of many of the organic compounds of the benzoic series. Several beautiful bodies, which, from the comparative costliness of the parent materials, had only been obtained previously in very small quantities, may now be prepared in large bulk, such as nitrobenzole, nitraniline, &c. Dr. Hofman has recently used coal-tar benzole, prepared by a method which will be described below, as a convenient source of aniline, of which base he has thus produced a large quantity for some researches in which he has been engaged.

The facility with which the vapor of benzole is taken up and retained by the air at its ordinary temperatures has been mentioned above. This property has been made to do service, with great success, in an apparatus for illumination, in which a stream of air, having passed through a reservoir of the volatile hydrocarbon, is conducted through pipes to the burners, at which, being ignited like coal-gas, it yields a light of extreme brilliancy and whiteness.

The property possessed by alcohol and pyroxylic spirit of burning with an almost lightless flame, so opposite to that of the highly carbonized benzole, renders it easy, by properly adjusting a mixture of the volatile oil with either of these spirits, to obtain a fluid which shall be readily vaporized, and shall yield a flame of any required degree of whiteness. Thus a mixture of 1 part by measure of benzole and 2 parts of spirit of spec. grav. about 0.840 forms an excellent fuel for a portable gas-lamp, which supplies itself with vapor by the heat which it generates in combustion. Any excess of spirit diminishes the luminosity of the flame, while too much of the other causes a tendency to smoke. Similar mixtures may be made of benzole with acetone, or with other inflammable liquids poor in carbon.

The inhalation of benzole vapors for the production of insensibility to pain is already on record as effectual.

The promises which benzole makes of utility are sufficiently numerous to encourage a belief that it may form a special object of manufacture and of commerce. It may be procured to any extent from coal tar or from the light naphtha in which it has hitherto been "wasting its sweetness on the desert air." If absolute purity be not required, it may be prepared, with very little expense and trouble, either in the laboratory or on the large scale in vast quantities; and by a further slight outlay of time, any required degree of purity may be ensured in the product. The description of a method which has been found to yield very satisfactory results may be not devoid of interest.

The boiling-point of benzole is the same as that of alcohol of spec. grav. 0.825, (176°F.;) it is evident therefore that any of the summary processes of rectification which are practised by distillers in the manufacture of alcoholic spirits, are applicable to the separation of benzole from the ess volatile fluids of the naphtha. The method now to be described is one which extracts nearly the whole of this spirituous hydrocarbon by a very slight expenditure of time.

The light coal naphtha (of which it is best to take that which came over at the commencement of the distillation of the tar, and contains the benzole less diluted with substances having higher boiling-points) is placed in a metal retort, which is surmounted by an open vessel filled with water, and containing a worm or chamber, into which the vapor of the naphtha passes directly from the retort, and so arranged, that the less volatile fluids, which will be condensed in it, will flow back into the retort, or into a separate receiver, while the fluids more volatile than water will pass on in vapor to another condenser, which is kept as cold as possible. The water surrounding the still-head will gradually rise in temperature as the operation proceeds, and will at last boil; and when this takes place (or if the heating of the water be checked at any period of the process by

addition of cold water,) distillation will cease; for no fluid remains in the retort whose vapor is not condensable at the temperature of the head, which can never rise above 212° F. The distillate being rectified a second time in such an apparatus, keeping now the temperature of the head at or a little below 176° F., and reserving the part which comes over before the temperature in the retort has passed 194° F., a large proportion of a very volatile oil will be obtained, which, when exposed to a temperature of 4° F., will become solid to at least half its bulk. Of course, if the apparatus be double, the same result may be obtained by a single operation. A comparatively small quantity of a similar product may be obtained by receiving separately the first two or three gallons that run off from the common stills on the rectification of some hundred gallons of the light naphtha.

This produce should then be agitated with about a quarter of its bulk of oil of vitriol, or better still, with about one-tenth of strong nitric acid, and then, after separation from this agent, with oil of vitriol as above. It should then be separated from the acid and distilled (or it may be distilled from the sulphuric acid,) reserving again the portion given off below 194° F. The distillate, being tested by agitation with oil of vitriol, should remain perfectly colorless, and the acid should not now acquire a darker color than a pale straw-brown; if it acquires a deeper tint, the process should be repeated. When this result is obtained, the oil should be well washed with water, and finally with an alkaline solution.

Its further purification may now be entrusted to its congealing property. It should be exposed to a temperature of about 4° F., (which may be conveniently attained by a mixture of ice and salt;) the solid portion being then pressed and filtered, the result, after treatment with chloride of calcium, is fit for use.

The use of sulphuric acid in this process is to remove all

the basic substances present, to oxidize the brown coloring matter, (of which however but a small quantity accompanies the most volatile part of the light coal naphtha,) and to remove such of the neutral oils as form compounds with oil of vitriol. Among these latter, an alliaceous oil, more volatile than benzole, is withdrawn, while the latter entirely resists the action of this acid even on being boiled with it. The nitric acid assists in the removal of the oxidable substances, and by forming a small quantity of fragrant nitrobenzole, (which is left behind as residue on the distillation of the fluid,) improves the odor of the product.—*Chem. Gaz. from the Quarterly Journ. of the Chem. Soc.*

ART. LXXX.—RESEARCHES ON THE COMPOSITION OF HONEY.

By M. Soubeiran.

The honey of bees contain two different sugars, the one solid, the other liquid. The former has been considered as identical with the granular sugar, which is deposited in the course of time from the syrup of the grape, or from the syrup of cane-sugar altered by acids. With respect to the liquid part of honey, it has been little examined. M. Biot, however, has ascertained that it consists of a sugar which turns the rays of polarized light to the left.

The experiments contained in this memoir show that honey contains three distinct sugars,—first, the granular sugar, or glucose of chemists; another sugar, with right-handed rotation, and which is alterable by acid; and lastly, a sugar, the rotatory power of which is exerted towards the left, but with an energy almost double that of the sugar acted upon by acids.

I found the sugar possessing a right-handed rotation, and which is capable of being altered, in ordinary honey; but

it is especially abundant in the liquid honey contained in the cells of the comb. The proportion is so great, that a solution of this honey which had a deviation of +0.96 ♁ acquired, after the action of acids, a rotation in the opposite direction equal to —13.78 ♁. I have named *liquid sugar of honey*, the liquid portion of which can be extracted from honey by pressure. My experiments were made upon a sugar which had been extracted in 1841, and which has kept to this day without experiencing the least change, or exhibiting any sign of crystallization. This circumstance alone would suffice to distinguish it from the sugar altered by acids, which would soon have solidified into a mass of granular sugar. The liquid sugar of honey presents, however, a great number of characters which belong to cane-sugar altered by acids. Like it, it is uncrystallizable, and may be reduced to the state of barley-sugar, transparent and solid, but which melts with great facility; again, it resembles it in being very sensitive to the action of alkalies, and is readily destroyed by their influence. The two sugars have the same chemical composition, and enter into combination with the alkalies. Thus the totality of these characters would tend to confound these sugars; but they are distinguished almost immediately by the absolute impossibility of converting the liquid sugar of honey into granular sugar, and by a very great difference in the rotatory power, which is nearly double in the liquid sugar of honey.

The absolute rotatory power of this liquid sugar at the temperature of 55°.4 F. for the red ray and for a length of 100 millimetres, was found equal to —33.103 ♁, whilst that of sugar changed by acids was found under the same circumstances merely =18°.933 ♁. The liquid sugar of honey retains the rotatory power to the left, even after it has been brought to the solid state; it is one of a very small number of bodies in which this peculiarity has been observed.

The third sugar which forms part of the honey is distin-

guished from the granular sugar from its being altered by acids, and from the liquid sugar in possessing a rotation to the right. Irs amount, which is pretty considerable in the liquid honey of the combs, diminishes in time, and may even disappear entirely in solidified honey.

I have limited myself at present to the establishing the facts as they result from observation; it is my intention to submit the honey of the combs to careful investigation, and also to inquire into the history of the curious transformation of the liquid into solid honey. Some experiments which are not yet completed, promise to throw considerable light upon these phenomena, and some facts of the same class which have already been published by M. Dubrunfaut.—*Chem. Gaz., from Comptes Rendus.*

ART. LXXXI.—ON THE COLORING MATTERS OF DUTCH OR CAKE LITMUS.

By Jonathan Pereira, M. D., F. R. S.

The object of the present notice is to draw attention to the coloring matters employed by the Dutch to color *cake litmus;* which, as is well known, is wholly imported from Holland.

The essential coloring matter of this pigment is obtained from lichens. In England two dyes or pigments only, both of a purple color, are procured from these plants: they are *orchil* and *cudbear;* the former a liquid or pulp, the latter a powder. The substances which are essential to their production are certain lichens, water, ammonia, and oxygen (of the air.) By the united agency of the three latter substances on certain colorific principles contained in the lichens, one or more colored products are obtained, which, though probably not identical, pass under the

general name of *orceine*. In order to obtain the well known blue color which is essential to the production of cake litmus, it is necessary to use, in addition to the ingredients above mentioned, a fixed alkali, namely, either potash or soda. Without this the product would be purple, in other words, it would be orchil or cudbear. The Dutch manufacturers use, I suspect, potash; for if a cake of litmus be ignited in the outer cone of the flame of a candle, the flame acquires a whitish violet tint, indicative of the presence of this alkali. This suspicion is confirmed by the statement of Ferber, who saw litmus in process of manufacture at Amsterdam, and who tells us that besides the lichen, there were employed urine, lime-water, slacked lime and potashes. The urine was used to yield, by decomposition, carbonate of ammonia; and the carbonate of potash, and probably was otherwise useful in the process.

In order to give body to the blue coloring matter thus produced, and which I shall provisionally call *lichen blue*, the Dutch employ some one or more earthy substances. to enable them to form the litmus into cakes. Ferber does not appear to have been aware of this; for he says that the lichen has been sufficiently macerated, and the blue color developed, the mixture is ground in a mill, which, he adds, he was not allowed to inspect. I presume that the Dutch manufacturer used something, in this part of the process, which he was anxious to keep secret.

The presence of the mineral or earthy constituent of litmus is readily shown by exposing some cakes of litmus, in a platinum or glass capsule, to the heat of a spirit lamp. The coloring matter is volatilized and destroyed, leaving the fixed constituents, presenting the volume and shape of the original cakes. Into the composition of the ashes of litmus it is not the object of this paper to enter.

In order to give these cakes a strong blue color, the Dutch manufacturer introduces into the paste another blue coloring matter, namely, *indigo*. Hitherto no one has alluded

to the presence of indigo in cake litmus; yet the facts I am about to lay before the Society leaves no doubt, in my mind, of its existence in all the specimens of Dutch litmus which I have hitherto examined. Ferber, of course, makes no mention of it; and I have no doubt that one reason why he was not permitted to inspect the mill was, that he might not discover the fact of the introduction, not merely of the earthy matter to give body to the cake, but also of indigo to give color.

The existence of indigo in cake litmus is proved by the following facts:

1st. The *color* of the cake is indigo-blue.

2dly. Their *odor*, when fresh, is essentially that of indigo. There is also a slight violet smell, which is developed by the lichens when undergoing fermentation, and which has led some writers into the error of supposing that Florentine orris is used in the manufacture of litmus.

3dly. If the cakes be rubbed with the nail they assume the well known coppery lustre which characterizes indigo; but which of course is much less intense in the litmus cake than in a mass of pure indigo.

4thly. If the cakes be heated by a spirit lamp, in a platinum capsule or watch glass, a vapor is evolved, which is known to be that of indigo by the following characters—

α. Its peculiar and very characteristic odor.

β. Its reddish-violet color.

γ. Its condensation in the form of beautiful coppery-purple crystals, which, when rubbed with oil of vitriol, form the blue liquid known as *sulphate of indigo*, and which is decolorized by hypochlorite of lime. The crystals, when examined by the microscope, present, when viewed as opaque objects, a beautiful coppery brilliancy; and when viewed as transparent objects, by transmitted light; some of them are of a deep blue color.

5thly. Litmus cakes, when deprived of their lichen-blue by digestion in distilled water or spirit, still retain a blue

color, showing that they contain a blue coloring matter insoluble both in water and spirit.

If these facts are considered sufficient to establish the existence of indigo in litmus cakes, it follows that the analyses of litmus hitherto published cannot be relied on, and in fact are of little value, since none of them make any mention of indigo as a constituent of litmus.

My examination of litmus cakes leads me to infer that they consist essentially of five parts:

1. *Lichen-blue.*
2. *Indigo-blue.*
3. Organic remains (portions of the lichenous tissues.)
4. An ammoniacal salt, separable from the cakes, by sublimation, in the form of carbonate of ammonia.
5. Mineral or earthy matter (chalk, &c.)

The lichen-blue is the peculiar coloring matter which renders litmus valuable as a test. It is soluble in water and in spirit, is reddened by acids, but does not become green by the addition of alkalies.—*Pharm. Journ.*

ART. LXXXII.—ON THE CINNAMON REGION OF EASTERN AFRICA.

By Mr. W. D. Cooley.

The eastern angle of Africa was at a very early period named, from its exchangeable produce, Aromata; and from the Straits of Bâb el Mandel to Cape Gardafui, we then meet in succession the *Regio Myrrhifera, R. Libanotophora, and R. Cinnamonifera.* In the classic ages of Greece and Rome, the belief was general that most spices were derived from Arabia Felix or Yemen, the country of the Sabæans, in a later age called Hymiarites, or Homerites. But a care-

ful examination of ancient authors, proves that the Sabæans were but the *carriers*, not the producers, of these aromatics. Herodotus includes under the general term Arabia the whole territory east of the Nile, and in giving his semi-fabulous account of the mode of collecting cinnamon, had included not the peninsula of Arabia, but the African part east of the Nile. Besides Herodotus, a long list of ancient authors may be quoted as supporting this view of the subject, viz: Eratosthenes, Strabo, Pliny, Ptolemy, Arrian, (the author of the Periplus) Philostorgius, Cosmas, Indicopleustes,—all of whom agree in placing the region of Cinnamon at the eastern extremity of Africa. Theophrastus (the disciple of Aristotle,) Galen, and Dioscorides, all state that the best cinnamon was derived from Mosyllum. Arabia Felix owed its great prosperity to its carrying trade; and in Ezekiel we are informed that the Sabæans traded in Tyre "with the chief of all spices." In the inscription of Adulis (A. D. 330) copied by Cosmas, mention is made of "the tribes of the Rausi, who occupy the immense plains adjacent to the region of Frankincense;" and we have no difficulty in recognising in these Rausi the present Arusi, occupying the hills around the sources of the Webbe, and who are described as one of the great tribes of the Gâla. The commerce of this country underwent, at length, the most violent changes, and the original population has been driven back by the influx of Arabs and Mohammedan tribes, (the Somâli.) In an Egyptian papyrus dating as far back as the reign of Menephthah the Third, (B. C. 1100,) Dr. E. Hincks has discovered a mandate respecting the purchase of aromatics from the land of Arus or Arusa; and in coupling the local name and the merchandize, we can but conclude that Egypt three thousand years ago obtained a supply of aromatic drugs from the Analitic Gulf. This fact throws perhaps some light on the historical tradition "that Sesostris led an expedition to, and left graven monuments in, that quarter." That a country named at so early a

period from its valuable produce, should lose so important a trade, may be attributed to the following causes: 1. The fall of Egyptian civilization and of Paganism, on the customs of which depended the consumption of the aromatics. 2. The revolutions in the countries around the Red Sea accompanying the spread of Mohammedanism,—with the impeded intercourse between the Christian and Mohammedan worlds. 3. Discovery of the route to India round the Cape of Good Hope, and the consequent shifting of the channels of commerce. 4. The wanton destruction of the towns on the shores of the Red Sea by the Portuguese, and the implacable hatred therefore conceived by the natives towards Christians. The ancients and the Arabs appear to have known nothing concerning the cinnamon of Ceylon, though the latter speak of that of Malabar. Arrian, in his Periplus, mentions Malao and Mundi (perhaps the sites of Zeylah and Berbera) and Mosyllum as the most important places on the coast. "From this neighborhood is exported a large quantity of cassia, in consequence of which, this port requires ships of a larger size." Further on he mentions Acannæ (Buraidi, E. of Ras Ululah;) then, doubling Cape Aromata, he names Tabæ (near the Wadi Tohum) "where the country produces much spice, &c." Arrian afterwards names Opone (Hafoon) "which ports was visited by the ships from India, bringing the cane honey, called Sacchari." Ancient authors add, however, that cinnamon and cassia came from the interior. Hence, Ptolemy filled up the blanks in his maps between the frequented coasts and the sources of the Nile, which he adopted from Marinus Tyrius, by placing the cinnamon country above those sources, while he fixes the Region of Myrrh, which is, in truth, the Wadi Nogal, at the sources of the Astapus. If, therefore, the design be entertained of exploring this in many respects highly interesting country, there can be no doubt as to the limits within which may be confined the labors of the expedition, the chief object of which is to become acquainted

with the aromatic productions of the land. All these will be found in the angle cut off by the Wadi Nogal, or in the limestone mountains of the Singheli and Mijjerthein tribes, between Ras Gulwaini and Hafoon. South of this region begins the Khazain (the Azenia of the ancients,)—that is, the sandstone mountains and the desert. Within the limits here pointed out, on the south-western face of the mountains, at a moderate elevation, will probably be found the Laurineæ sought for, together with a great variety of aromata (spicy drugs,) enodia (perfumes,) and thymiamata (kinds of incense,) many of which are named, but not described by the ancients.—*Pharm. Journ., from Athenæum.*

ART. LXXXIV.—ACTION OF WATER ON LEADEN SERVICE PIPES. By E. N. Horsford, Professor of Chemistry in the University of Cambridge, U. S.

The following extracts are taken from a very important investigation published in the Proceedings of the American Academy of Arts and Sciences, for a copy of which we are indebted to the kindness of the author. The researches were undertaken at the request of the Board of Consulting Physicians of the city of Boston, and extend to fifty pages of closely printed letter-press. We give the author's conclusions, which have more than a local interest, and the method which he proposes for determining small quantities of lead, which promises to be of considerable service in such investigations :—

The waters used by man in the various forms of beverage and for culinary purposes are of two classes, viz.

1. *Open waters, derived from rain-falls and surface-drainings, like ponds, lakes, rivers and some springs; and*

2. *Waters concealed from sunlight, and supplied by lixiviation through soils or rock, or both, of greater or less depth, such as wells and certain springs.**

They differ, (*a.*) in temperature; well-water, through a large part of the year, is colder than lake, pond or river water; (*b.*) in the percentage of gases in solution; recently drawn well-water, in summer particularly, parts with a quantity of air upon exposure to the surface of the temperature. In winter these relationships must to some extent be inverted, in high latitudes for a longer, and in lower latitudes for a shorter period.

(*c.*) They differ in the per-centage of inorganic matter in solution; well-waters contain more; (*d.*) in the relative proportions of salts in solution; well waters contain more nitrates and chlorides; and (*e.*) in the per-centage of organic matter; well waters contain less.

Relations of Lead to Air and Water.—(*a.*) Lead is not oxidated in dry air, or *(b.)* in pure water deprived of air. (*c.*) It is oxidated in water, other things being equal, in general proportion to the amount of uncombined oxygen in solution. (*d.*) When present in sufficient quantity, nitrates in neutral waters are to some extent reduced by lead. (*e.*) Both nitrates and chlorides promote the solution of some coats formed on lead.

(f.) Organic matter influences the action of water upon lead. If insoluble, it impairs the action by facilitating the escape of air; if soluble, by consuming the oxygen in solution, and by reducing the nitrates when present. The green plants, so called, the animalcula which evolve oxygen, are abundant in open waters in warm weather only, and of course when the capacity of water to retain air in solution is lowest; so that, although oxygen is produced in open waters by these microscopic organisms, it does not increase the vigor of their action upon lead.

* Rain-water is to some extent employed as a beverage. It is more nearly allied to waters derived from surface-drainage.

(*g.*) Hydrated peroxide of iron (iron rust) in water is not reduced by lead. Hence may be inferred the freedom from corrosion of leaden pipes connected with iron mains, so far as the reduction of the pulverulent peroxide of iron may influence it.

(*h.*) Alkaline chlorides in natural waters deprived of air do not corrode lead. (*i.*) Salts generally impair the action of waters upon lead, by lessening their solvent power for air, and by lessening their solvent power for other salts.

A coat of greater or less permeability forms in all natural waters to which lead is exposed. The first coat *(j.)* is a simple suboxide absolutely insoluble in water and solutions of salts generally. This becomes converted in some waters into a higher oxide, and this higher oxide, uniting with water and carbonic acid, forms a coat (*k.*) soluble in from 7000 to 10,000 times its weight of pure water. The above oxide unites with sulphuric and other acids, which sometimes enter into the constitution of the coat *(k.)*; uniting with organic matter and iron rust, it forms another coat (*l.*) which is in the highest degree protective. The perfection of this coat, and of the first above mentioned, may be inferred from the small quantity of lead found in Croton water (New York) after an exposure in pipes of from twelve to thirty-six hours, and from the absence of an appreciable quantity in Fairmount water (Philadelphia) after an exposure of thirty six hours, when concentated to $\frac{1}{200}$ths of its bulk.

Method of determining small Quantities of Lead.—The recognition and quantitative determination of very minute quantities are not always without difficulty; where many and rapid determinations are required, the processes of gathering upon a filter, washing, drying, igniting and weighing consume far too much time, and are sometimes less accurate than other and more indirect methods.

That which I have employed is based upon the mode of analysing silver coin proposed by Gay-Lussac, and general-

ly adopted at mints. The same general method has been extended by Gay-Lussac to ascertain the strength of alkalies and bleaching powder. It is employed with protosulphate of iron and subchloride of mercury for the latter purpose. It is the method of graduated solutions.

A gramme of lead in the form of the acetate (common sugar of lead,) which contains 3 atoms of water, is dissolved in 100 grms. or parts of distilled water. This constitutes solution No. 1.

10 parts of this solution are diluted with 90 parts of water to make solution No. 2.

10 parts of solution No. 2, diluted with 90 parts of water, make solution No. 3.

In the same manner solutions No. 4, No. 5 and No. 6 are prepared.

10 parts of each solution are placed in corresponding test-tubes (about six inches long, five-eighths of an inch wide, and closed at one end,) and hydrosulphuric acid transmitted through them, till the liquid, first blackened by the formation of sulphuret of lead, becomes clear.

Test-tube No. 1 contains one-tenth of a gramme of lead in the form of sulphuret—a black powder at the bottom.

Test-tube No. 2 contains one-hundredth of a gramme.

No. 3, one-thousandth.

No. 4, one ten-thousandth.

No. 5, one hundred-thousandth.

No. 6 yielded no precipitate without concentration.

Each succeeding precipitate in the series, setting aside a slight allowance to be made on account of solubility, was one-tenth as voluminous as the one above.

Having prepared this scale of quantities, it is required to determine the amount of lead in a given diluted solution. An experiment is made to ascertain if the quantity be large enough to give an immediate precipitate with sulphuret of ammonium. This being decided in the negative, 50 cubic centimetres or grammes of water (corresponding with 50

parts of the scale of solutions) are carefully evaporated to dryness and ignited in a small porcelain capsule, to expel any organic matter that may have been present, moistened with nitric acid, and then warmed, with the addition of acetic acid and water, till the volume becomes 10 cub. centim. A drop of acetate of potash is then added, and then hydrosulphuric acid gas transmitted through the solution.

A precipitate results, or it does not. If it does, to know its value or the amount of lead it contains, the scale is resorted to. Though it might rarely be possible to identify it with either one of two precipitates in the scale, there could be no difficulty in deciding between which two it should fall, or nearest to which one of two it should be placed.

If 50 cub. centim. thus treated yielded no precipitate, 100 cub. centim. were evaporated to dryness, and the residue similarly treated. If this failed, 500 cub. centim. were taken, and in some instances more, and the same course pursued.

It was natural to suppose that the presence of foreign bodies, such as occur in natural waters, might embarrass the precipitation. This led to the preparation of a series of graduated solutions of lead, with all the common salts occurring in waters, from the reagents in my laboratory. They are similarly treated with acetate of potash, free acetic acid, and a stream of hydrosulphuric acid; and though it was possible to see differences in the amounts of the precipitates, they fell very greatly within the differences between the successive members of the graduated series. *Chem. Gaz.*

ART. LXXXV.—ON A NEW ALKALOID CONTAINED IN THE SEED OF AGROSTEMMA GITHAGO.

By H. Schulze.

This alkaloid, which the author has called *agrostemmine*, is contained abundantly in the outer coat of the seed. The entire seeds were exhausted with weak alcohol, to which some acetic acid had been added, the concentrated liquid mixed with magnesia, and the dried precipitate treated with alcohol. On evaporating this solution, the alkaloid separated in crystals, which, after frequent recrystallization formed yellowish-white laminæ. They fuse at a slightly elevated temperature, dissolve with difficulty in water, readily in alcohol, communicating to it an alkaline reaction. It furnishes, by neutralization with dilute acids, crystalline salts. The platinum double salt was obtained as a reddish-brown crystalline precipitate, by mixing an alcoholic solution of agrostemmine with chloride of platinum. The chloride of agrostemmine and gold separates slowly in yellow granular crystals from an alcoholic solution.

The sulphate is obtained in beautiful crystals, which are readily soluble in hot water, still more so in alcohol. The phosphate forms a bulky precipitate.

On boiling with solution of caustic potash, it is decomposed with evolution of ammonia, differing in this respect from all the other natural alkaloids. The solution then furnishes a white precipitate with muriatic acid. Concentrated sulphuric acid colors it first red, and then blackens it. —*Archiv de Pharm.*

ART. LXXXVI.—ON THE RELATIONS EXISTING BETWEEN SUGAR AND TARTARIC ACID.

By M. Bouchardat.

Sugar and tartaric acid possess characters in common which are well worthy the attention of Chemists. M. Bouchardat thus describes them:

When sugar or tartaric acid is thrown on to incandescent coals, in either case empyreumatic products are given off, which are distinguished by the odor of caramel.

When pounded in a mortar, in the dark, both crystallized sugar and tartaric acid emit a manifest electric light. The other organic acid, and citric acid in particular, do not possess this property. It therefore follows that we may distinguish tartaric from citric acid, and ascertain whether the latter has been adulterated with the former.

Sugars in solution act upon polarised light, possessing in a high degree the power of rotating the plane of vibration. Cane-sugar, which has been changed by acids under the influence of heat, possesses this power, and the direction of the rotation may even be altered by the action of the acid. Tartaric acid, either free or combined with water, with bases, or with boracic acid, presents remarkable instances of variations of rotatory power.

A concentrated solution of citric acid being void of rotatory power, nevertheless acquires that property if mixed with tartaric acid. It therefore follows that we may also, by this means, detect the adulteration of citric with tartaric acid.

In addition to the characters possessed in common by sugar and tartaric acid, very frequently the decomposition of these two substances gives rise to similar products.—*Pharm. Jour., from Journal de Pharmacie.*

ART. LXXXVII.—ON THE PREPARATION OF SUCCINIC ACID FROM MALATE OF LIME.

By Prof. Liebig.

The highly important and beautiful observations of Dessaignes on this subject induced me to examine whether the malate of lime might not be converted more rapidly and perfectly into succinate of lime by an ordinary process of fermentation than by the plan proposed by that chemist, and whether an advantageous method of manufacturing succinic acid on a large scale might not be founded upon it.

These experiments have been crowned with complete success. The decomposition of the malate of lime can be effected far more easily and rapidly than the conversion of the lactate of lime into butyrate, by employing the same ferment as is used in the butyric acid fermentation. The malic acid is decomposed under these circumstances into succinic, acetic and carbonic acids.

When to a mixture of 1 part malate of lime and 5 to 6 parts of water the tenth part of the volume of the water of ordinary yeast is added, a pretty lively evolution of gas soon ensues when the mixture is placed in a warm situation. The gas which is disengaged is pure carbonic acid, and is absorbed without the least residue by potash.

After three days an essential change in the form of the malate of lime is perceptible; it becomes granular, heavy and crystalline, and in the course of the fermentation these granules increase constantly in size. When the fermentation is complete, *i. e.* when the evolution of gas has ceased, the mixture loses on agitation its muddy condition; the granules appear under the microscope to be composed of stellate groups of transparent needles, which quickly subside like heavy sand when stirred. These crystals consist of a double salt of succinate of lime with carbonate of lime. The supernatant liquid contains acetate of lime.

The formation of succinic acid is effected with equal ease and rapidity by putrefying fibrine or putrefying cheese; the latter is especially adapted for this purpose; the following proportions prove to be most advantageous:—3 lbs. of crude malate of lime, as it is obtained from the expressed juice of the berries of the mountain ash,* after being twice or thrice washed with water, is mixed with 10 lbs. of water at 104° F. in an earthen pan, and 4 oz. of putrid cheese, which has been previously rubbed into an emulsion with water, is added to the mixture. When kept between 86° and 104°, a disengagement of gas very soon begins, which continues from five to six days (longer at a low temperature.) In another experiment with 15 lbs. of malate of lime, the fermentation was over in four days.

When every sign of fermentation has disappeared, the granular crystalline deposit is collected upon a strainer, washed several times with cold water, and the succinic acid then separated by means of sulphuric acid. For this purpose, the crude succinate (and carbonate) of lime is mixed with dilute sulphuric acid until no further effervescence is perceptible, and the quantity of sulphuric acid consumed is noted down. Upon this an amount of dilute sulphuric acid equal to that consumed is added to the paste, and the entire mixture heated to boiling, and kept at this temperature until the granular consistence has entirely disappeared. The liquid is separated from the gypsum formed by the filtration through a linen bag, the gypsum washed, and the acid liquid concentrated by evaporation; it contains in solution a mixture of bisuccinate of lime with succinic acid. When it has been so far evaporated that a crystalline pellicle begins to form on the surface, concentrated sulphuric acid is added to it in small portions until no further preci-

* In this country the malate of lime might probably be obtained from culinary rhubarb according to the process described by Mr. Everitt, Chem. Gaz., vol. i., p. 248, [or from sumac berries in the U. States.—Ed.]

pitate of gypsum is formed. In general the liquid congeals to a pasty mass by the newly formed gypsum; it is diluted with water, and the succinic acid separated by washing. On evaporating the liquid and cooling, a crop of brownish-colored crystals of succinic acid separates, which contains minute traces of gypsum. This colored acid is dissolved in boiling water, filtered, set aside to cool, the crystals thrown upon a funnel, and the mother-liquor removed with cold water. The acid obtained by this second crystallization is again dissolved in water, boiled with a little animal charcoal, and the transparent solution crystallized. The crystals are of a dazzling white; they can easily be freed from a trace of gypsum by solution in alcohol or sublimation. 3 lbs. of dry malate of lime furnished from 15 to 16 oz. of dazzling white succinic acid. In my experiments not a trace of malic acid was found in the mother-liquor from the succinic acid; so that in this remarkable process of fermentation the whole of the malic acid is completely decomposed. The process with putrid cheese differs from that with yeast, in hydrogen gas being disengaged along with the carbonic acid towards the end of the operation.

Science is indebted to M. Dessaignes for this beautiful discovery, and it is to be hoped that fermentation will come more into use as one of the most powerful agents for chemical decompositions. It is easy to prepare from malate of lime any amount of this interesting but hitherto expensive acid; and a number of useful applications may possibly follow from this discovery.—*Chem. Gaz. from* Liebig's *Ann.*

ART. LXXXVIII.—RESEARCHES ON EMULSINE.

By B. W. Bull.

The emulsine employed in the following experiments was prepared from sweet almonds, from which the oil had been removed by pressure. They are formed into an emul-

sion with three times their weight of water, and the whole exposed for twelve hours to a temperature between 68° and 78°. In this interval a yellowish-white coagulum separates on the surface; the liquid is of a light yellow color; and furnishes a precipitate with acetic acid, which however no longer appeared after it had been kept for two or three days. Alcohol furnishes a precipitate which entirely redissolves on the addition of water. As soon as the coagulum had separated, the liquid was filtered, and also the precipitate produced by the acetic acid. The emulsine was precipitated from the filtered solution with alcohol of 0·848 spec. grav., of which it acquired twice its volume.

The emulsine thus obtained, well washed with alcohol and dried in the air, is a transparent, gummy, readily-friable substance of a dark or reddish-brown color, without odor and without any particular taste. It dissolves only after long standing or on trituration with water, leaving an insoluble residue, which contains, besides some phosphate of magnesia and some phosphate of lime, a considerable amount of organic substance. This insoluble residue, even when completely washed with distilled water so as to remove all soluble matter, still furnishes the characteristic reaction of emulsine with amygdaline. Four analyses of this residue furnished the following results :—

	I.	II.	III.	IV.
Organic substance	56	69·45	59·48	80·27
Ash	44	30·55	40·52	10·73

The solution of this emulsine is opalescent, and very readily converts amydgaline to oil of bitter almonds and prussic acid.

Emulsine which has been dried *in vacuo* over sulphuric acid has nearly the appearance above described; in general it is not so dark, sometimes having a brownish yellow tint, and in other cases a brownish-red. When dried in the air, in proportion as the alcohol escapes it absorbs moisture with great avidity.

The precipitate of emulsine acquires a totally different

appearance when it is first washed with strong spirit, and then with absolute alcohol, until every trace of water has been removed, and then dried *in vacuo* under sulphuric acid. It then forms a milk-white, very friable mass, which is perfectly opake, without lustre, and far more soluble than the emulsine prepared according to other methods. About 6 grms. of emulsine was obtained from a pound of almonds after the oil had been expressed. If larger quantities are employed, the time required for washing and filtration is considerably lengthened, and a more or less colored preparation is obtained. If it is dried over sulphuric acid in a recipient filled with air, it becomes transparent, gummy and colored by the absorption of water.

Certain substances prevent the reaction of emulsine with amygdaline, for instance alcohol and acetic acid. The property of being precipitated by alcohol is not peculiar to the emulsine, but is owing to the phosphates which it contains in solution, and with which it so intimately combined that it was impossible to separate the emulsine without destroying it.

Emulsine has an acid reaction. After it has been washed with alcohol until what passes through is perfectly neutral, the moist emulsine strongly reddens blue litmus-paper. Emulsine which has been dried and again dissolved is likewise acid, and this acid property it owes to the presence of phosphates in the almond emulsion. An emulsion f almonds, which was neutralized with lime-water and filtered, distinctly furnished the reaction with amygdaline; but the filtered liquid was not precipitated by alcohol, and it contained not a trace of phosphoric acid. Ammonia acts in the same manner. The liquid, it is true, become sturbid on the addition of alcohol; but the turbidness cannot be removed by filtration, and is deposited only after some days as a scarcely perceptible precipitate.

When the neutralized liquid is set aside at the ordinary temperature, it begins in the course of a few days to be de-

composed, with a disagreeable odor; a precipitate separates, but it no longer becomes acid.

Emulsine does not coagulate, but at a boiling heat it behaves in a very peculiar manner; between 95° and 96° its solution becomes turbid, at 113° it becomes opake and milky, and between 185° and 212° it gradually deposits a snow-white granular precipitate. If the liquid is boiled for a few minutes, the filtered solution, each time that it is heated to boiling, becomes quite opake, and deposits a copious flocculent precipitate; on cooling, this entirely redissolves. This experiment can be repeated several times with the same result. The granular precipitate first formed amounts to about 10 per cent. of the emulsine employed; it is perfectly white, can be easily reduced into a very fine powder, and leaves on incineration a neutral ash, which in one experiment amounted to 48·74, and in a second to 59·11 per cent., and consisted of phosphate of magnesia with some phosphate of lime. The organic substance combined with it contained nitrogen, but no sulphur that could be detected in it by potash and a salt of lead.

The liquid filtered from the precipitate contains two products of decomposition of emulsine, one of which, forming about a fourth of the quantity originally employed, is not precipitated by alcohol, whilst the other, constituting about 30 per cent., separates upon the addition of strong alcohol in the form of a white granular precipitate. Washed with alcohol and ether and dried, this precipitate forms a white, opake, tenacious mass, which is difficult to powder, and contains a large, although variable, amount of the above salts of phosphoric acid. Several experiments furnished from 18 to 35 per cent. of ash. The analyses gave the following results, according to which the substance differs essentially from emulsine:—

Carbon	43·17	40·11	42·48
Hydrogen	6·85	6·73	7·92
Nitrogen	8·62	8·34	8·48
Oxygen and sulphur	41·36	41·83	42.02

Acetate of lead separates this substance into two others, one of which contains sulphur, the other none. To the aqueous solution of the fresh precipitate obtained by alcohol, acetate of lead was added as long as a precipitate resulted; this was suspended in water, decomposed by sulphuretted hydrogen gas, and the excess of sulphuretted hydrogen expelled at a gentle heat. The filtered liquid had a strong acid reaction, which arose partly from phosphoric acid, partly from an organic substance. Upon concentration it formed a syrupy mass, which was decomposed by potash, with evolution of ammonia, and with a salt of lead it showed the presence of sulphur.

The liquid filtered from the precipitate obtained by acetate of lead, furnished, after removing the lead and the acetic acid, on evaporation, a neutral gummy mass, readily soluble in water, and which yielded a jelly with a solution of caustic potash. It contained nitrogen, but no sulphur.

Unboiled emulsine is so completely precipitated from its solution by neutral acetate of lead, that the filtered liquid no longer furnishes oil of bitter almonds with amygdaline, whilst the lead precipitate retains this reaction.

A solution of emulsine begins, in the course of four or five days, by exposure to the air at the ordinary temperature, to be decomposed with evolution of gas; it becomes turbid; gives with neutral acetate of lead, but not with acetic acid, a copious precipitate, and still retains for some time the reaction with amygdaline.

A solution of emulsine, which has been freed from the phosphates by neutralization with lime-water, yields with neutral acetate of lead a thick precipitate. This was decomposed with sulphuretted hydrogen. After filtration and removal of the excess of sulphuretted hydrogen at a gentle heat, an acid liquid was obtained, which left on evaporation an acid gummy mass containing nitrogen. It was insoluble in alcohol and ether; it formed with baryta and silver insoluble, with magnesia soluble salts.

The liquid filtered from the precipitate with acetate of lead

left on evaporation, after removing the sulphuretted hydrogen and acetic acid, a gummy nitrogenous mass.

On distilling the alcohol which had served to precipitate the emulsine, the liquid acquired a dark colour, and left on concentration an acid mass, the acid in which proved to be lactic acid.

The precipitate obtained with acetic acid previous to the precipitation of emulsine by alcohol, formed, after it had been freed from fat by exhaustion with alcohol and ether, a reddish fine light powder, soluble in alkalies; but on warming the solution, it is decomposed, with disengagement of ammonia. This substance is not precipitated from its alkaline solution by alcohol; it is moreover soluble in weak, and only partially soluble in concentrated acetic acid. It contains nitrogen and sulphur, and burns with a smoky flame, leaving a small quantity of neutral ash. It dissolves in strong muriatic acid into a beautiful red liquid, which color changes into a dark purple in the course of one or two days. It gelatinizes in sulphuric acid, and changes, with evolution of sulphurous acid, from red into black. On analysis it was found to contain 51.02 per cent. carbon, 6.87 hydrogen, 15.80 nitrogen, 25.74 oxygen, and 0.57 sulphur. The relation of nitrogen to carbon is as 1 to 7½.

In the maceration of recently-pounded almonds with ordinary alcohol, grape-sugar was extracted, which was obtained by means of water from the residue remaining on evaporating the alcohol.

When an emulsion of almonds, prepared as above directed, is allowed to ferment for some days at about 86°, an oily coagulum separates, and the subjacent liquid becomes more and more sour. This acidification has great resemblance to the becoming sour of ordinary milk. The conversion of the sugar into lactic acid, and the union of this acid with the bases which held the caseous substance in solution, explains the separation of this coagulum and the absence of any precipitate with acetic acid, as soon as a sufficient quantity of lactic acid has

been formed to separate the caseous substance from its combination with the alkalies.

Emulsine loses the property of decomposing amygdaline into oil of bitter almonds and prussic acid when its solution has been boiled, which is not the case when it is exposed in the dry state to a temperature of 212°.

It was found very difficult to obtain the substance in a pure state fit for analysis, on which account the results do not agree very accurately with one another; however, so much is evident from the analyses, that the emulsine precipitated by alcohol has a definite composition. The materials used for the following six analyses were prepared at different times. I. to IV. were dried for several days at 212°. For No. V. a fresh emulsion of almonds was first mixed with ether to dissolve the oil, and then set aside for two or three days in a closely-stopped vessel until the mixture had separated into two parts; the upper stratum was a thick, opake, somewhat gelatinous mass, and consisted of a solution of the oil in ether; the subjacent aqueous liquid was filtered, and immediately precipitated by alcohol. The emulsine prepared in this manner does not differ essentially in its composition from the others, as will be seen by the following numbers. VI. was prepared like I. to IV., but dried at 266° :—

	I.	II.	III.	IV.	V.	
Carbon,	43.59	43.74	42.75	42.09	43.08	43.15
Hydrogen,	6.96	7.33	7.37	7.34	6.81	7.39
Nitrogen,	11.64	11.40	11.52	11.52	11.52	11.52
Sulphur,	1.25	37.53	38.36	39.05	38.59	37.94
Oxygen,	36.56					

The formula $C^{9}H^{9}NO^{6}$ would correspond to these numbers; and if the amount of sulphur were likewise considered essential, it would be $10(C^{9}H^{9}NO^{6})+S$.—*Ibid. from Liebig's Annalen.*

ART. LXXXIX.—ON THE PLANTS FROM WHICH SENNA LEAVES ARE OBTAINED.

By J. B. Batka.

As I intend to notice only the officinal sorts of senna-leaves, as being by their medicinal qualities best known and distinguished, I may be permitted to make a separate genus of *Senna*. The fact that none of the officinal sorts actually possess the glands mentioned by Forskäl and De Candolle, and that the genus *Senna* is distinguished from the other species referred by De Candolle to *Cassia* by the peculiar form of the *fruits* (folliculi), their *dissepimenta* and *seeds* will justify this proceeding.

Although senna is one of the best known and frequently employed medicines, botanists have not yet succeeded in making out the confused synonyms of the genus; and I myself should not have been able to have done so but for the abolition of the monopoly which the government of Egypt held for so many years. This has given me the opportunity of becoming separately acquainted with the different species and their fruits, of which formerly Alexandrian senna was made up at Boulac, near Cairo. For several years past the various sorts of senna-leaves with their follicles have been obtained unmixed directly from the places where they grew. Formerly the follicles were in part picked out and sold separately under the name of *Folliculi Sennæ;* and as it was not known to which leaves these isolated follicles belonged, no judgment could be formed of those which were found in Alexandrian senna. The following senna-leaves are imported to us from the East:

1. From Alexandria, under the name of *Apalto Senna*, the mixture consisting of three different species of senna and of the *Cynanchum Argel*, discovered by Nectoux and Deile.

2. From Mecca, by way of Alexandria, the well known narrow-leaved *Senna*.

3. From Syria, by way of Aleppo, the obovate leaves.

4. From Tripoli, the mixture of two species, first discovered by Nees and myself.

5. From the East Indies, the narrow-leaved wild-growing Mecca Senna, and the Tinevelly Senna grown from seeds.

The description of Alexandrian senna is found in every class book. But as it contains the three principal species of all officinal senna-leaves, it is important that I should give their botanical analysis and their special diagnosis; and also examine the prevailing opinions respecting them.

Having, during my long residence at Trieste, bestowed great attention upon this subject, and afterwards received the communication of my lamented friend Sieber, and seen with great interest the beautiful specimens of Ehrenberg, in Berlin, where I was assisted by the advice of my friend Hayne, and having lately examined in Paris Delile's plant in company with Delile himself, I felt the importance of also inspecting Forskäl's plants in Copenhagen. My late friend Professor Schumacher, who resided there, had for some time been engaged with the examination of the same subject, and we examined together the specimens from Forskäl's own hand, contained in the herbarium of Vahl. There we found *Cassia Senna*, identical with the plant of the same name, which I had seen in the herbarium of Linnæus; further C. *angustifolia*, Vahl, with the inscription C. *lanceolata*, in Vahl's own hand. This I found identical with that in Wildenow's Herbarium, in Berlin. The real *lanceolata* of Forskäl, however, we did not then find. During my last journey, I looked over the different species of cassia in the British Museum, and again found that the English are the best conservators of botanical treasure, for there I found, at last, to my great astonishment, what I had so much missed at Copenhagen, namely, a perfect specimen,

with fruits of the narrow-leaved senna, with the inscription C. *lanceolata*, (probably written by Sir Joseph Bankes, for by Forskäl's hand, C. *Senna* only was written on it.) *In this no glands could be discovered;* the leaves were somewhat more developed, but the whole habit perfectly agreed with that of C. *angustifolia*, Vahl. Besides this, there was also a specimen of C. *ligustrina*, Forskäl, with the glands, but without fruits. The dispute about the glands was the cause of the quarrel between Delile and De Candolle, and I cannot help agreeing with the first in denying the presence of glands in the officinal species; for, in spite of many and laborious examinations of whole bales of stalks, I have as yet not been able to discover among senna-leaves in *commerce* stalks with glands. It was necessary, in the first place, to establish this fact; and I corresponded, therefore, lately with Professor Vahl, in Copenhagen. He sent me a leaf of a plant possessing glands, C. *lanceolata*, Forskäl, and upon which Forskäl is said to have written with his own hand, *Surdud Senna*. Judging from the leaf, this plant is C. *ligustrina*, and it is very probable that Forskäl only wrote the above-mentioned name from oversight. It is, however, much to be regretted that this mistake crept into his *Flora Ægypt. Arabica*, and thus to the detriment of science, has been promulgated in every manual. The leaves of this C. *ligustrina* are very like those of Tinevelly senna, but somewhat more pointed and (almost imperceptibly) finely ciliated at the edge. The fruit is a narrow, scymitar-shaped, curved, yellowish pod (*legumina linearia incurva*,) very different from the officinal folliculi, and consequently not belonging to *Senna*. The fruit I saw for the first time in the specimen preserved in the Linnæan herbarium. Whoever has not seen and closely examined this plant, may easily mistake it for the full-grown Mecca and Tinevelly or East India senna. The mistake of Forskäl, therefore, (who had manifestly not seen and collected this plant when in fruit) may be readily excused; I cannot however, omit to *correct his mistake publicly*.

The glands of the C. *ligustrina* are quite different from those which Nees has erroneously depicted as glands in the C. *lanceolata*, in the collection at Düsseldorf, and which Nectoux and Persoon, who were equally mistaken, also declared to be glands; for they are not glands, but only two hairy stipulæ subulatæ at the basis of either side of the petiole of the C. *acutifolia*, as in many other species of *Cassia* and *Wisteria*. The glands of C. *ligustrina* and C. *glandulosa* L., on the other hand, arise at ¼ or ½ inch distance from the bases, on the common petiole, from the hairy midrib, in the form of a small fungus of the size of a pin's head, with a yellowish stem and brown cap.

If we now pass to the principal question, Forskål's plant as C. *lanceolata*, we find that, (taking the specimen in the British Museum as the prototype,) it is identical with C. *angustifolia*, Vahl, and with Mecca and Indian senna-leaves, and I therefore declare it to be *Senna angustifolia*, which, as is well known, forms a part of the Alexandrian senna-leaves. *By this, therefore, the incorrect descriptions of Forskäl, in his "Flora Ægypto-Arabica," the less accurate synonym C. lanceolata, and above all, the error of De Candolle, respecting the glands, are got rid of; for C. acutifolia*, Delile, cannot be confounded with it without further mistaking it for *Senna acutifolia*. It remains the original *officinal* species of Sennaar, and is distinguished by the more elliptic form of the slightly hairy midrib, and by its peculiar smell and acrid taste. I examined Dr. Kotschy's very perfect and beautiful specimen, sent in 1840 from Sennaar to the British Museum, the smooth, brownish-green follicles contained between the dissepiments showing wrinkled seeds with yellowish seed-lobes and an enamel-like coating. Nees, in the collection of Düsseldorf, has erroneously mixed this species with C. *Senna* and C. *lanceolata*, and thus only increased the confusion of the synonyms of these otherwise beautifully and correctly depicted plants.

C. *Senna* of Linnæus is the third species of which the Alexandrian leaves are composed, and, out of respect for the authority of old Linnæus, by many ancient botanists considered as the prototype of the same. I can only consider it as the vehicle of all mistakes, which this name is intended to conceal. Most previous botanists have done the same (as Forskäl did with *ligustrina* and *lanceolata*) when tired of further examination. I have found it identical with C. *obtusa*, Roxburgh, *obovata*, Colladon, *obtusata*, *et obovata*, Hayne. The leaves of this species vary much in form; all the more fully grown leaves are at the top broadly blunted (*obtusata*) and retuse (*retusa*) whilst the younger leaves present this characteristic less distinctly, and are more ovate (*subovata*, *obovata*.) In commerce, this species has been very correctly named from this latter character, and I shall therefore call it *S. obovata*. The climate in which the *Senna obovata* grows, imparts to the leaf its peculiar consistency. The color of the leaves is brownish-green; those from Tripoli have a more delicate parenchyma than those from Saida and Aleppo; those from Senegal are thicker and more like leather. The smell of these leaves is inconsiderable; their taste, when chewed, mucilaginous and herbaceous; the dark-green follicles, when ripe, have a contracted kidney-like form; the unripe ones, however, have a more bottle-gourd, rounded form, and after the production of the seeds, which are somewhat torulose, have crest-like verticle protuberances projecting in the middle, and the seeds have very yellow-colored cotyledons.

That *Cynanchum Argel* materially increases the smell of the Alexandrian leaves, and is, therefore, intentionally mixed with them, is now an established fact; the pale-green leaves, whitish blossoms, and blackish fruit, of this plant, which are found among the so-called officinal leaves (as imported by us,) sufficiently mark their presence; and in order to suppress entirely this adulteration, I propose to cease

buying this Alexandrian commercial sort, till the practice is given up.

The narrow-leaved *Mecca senna*, which I have designated *Senna angustifolia*, is mixed with the small felty leaves of a tender plant, which I discovered in it some time since; and having recently received it from Delile as a variety of his C. *acutifolia*, I now take the liberty to introduce it as *Senna tomentosa*. This plant is no shrub, but like the Mecca and Tinevelly senna, merely an herbaceous plant. It has, therefore, only very delicate, but not ligneous stalks, like the *Senna acutifolia* and *obovata*. It is impossible, in my opinion, to regard this *Senna tomentosa* as a variety of *acutifolia*, for not only the felt-like leaves and fruits, but also the whole habit, is much more delicate and different, while the leaves are *considerably smaller*, and of a more oval form, which certainly possesses a small point (*mucro*) but no bird's-tongue-like appearance, as *Senna acutifolia*. Delile accounts for this, by assuming that the hairy character is neither constant, nor a safe criterion when the leaves and fruits are perfectly developed, and I myself do not consider it of great importance; but still in one and the same bale of Mecca Senna these leaves and fruits are found in several stages: and although the fruits, *if the seeds be perfectly ripe*, having actually lost the blackish color and part of the yellowish hair, still their upper suture always remains, as I have had frequent opportunity of satisfying myself, and, contrary to what is the case with the follicles of *Senna acutifolia* and *angustifolia*, distinctly ciliated with fine hair; and likewise the leaves, even when full grown (5—6‴ long and 3—3⅓‴ broad) are always felt-like and furnished with whitish hair. Darnaud sent this plant in 1843 to Delile from the valley of Dumrich in Nubia; but Boré had previously discovered it in Arabia, and the bale which I examined had been imported from Yemen, (in Arabia.) At first I took these delicate small hairy leaves to be another sort (*Tephrosia Apollinea*)

found in the Tripoli Senna, and which I had already met with in 1828; but I soon convinced myself, by examining the fruits mixed with it, and comparing it with Darnaud's specimen, that it was a real *senna*.

The Tripoli leaves consist, according to my examination, of *Senna acutifolia*, *S. obovata*, a trifling addition of *S. angustifolia*, and occasionally, as I found in 1828, and again in 1840, of the leaves of *Tephrosia Apollinea*, which, not being as constant as the adulteration of the Alexandrian leaves with *Cynanchum Argel*, I am inclined to consider as accidental. This plant is perfectly well figured in Delile's *Flore d'Egypte*, page 144, and described by him as *Galega*; the delicate hairy leaves are soft, green, oblong, ovate, and, therefore, not easily to be distinguished from those of *S. obovata*, if this were not facilitated by the narrow, yellowish, hairy pods, which I found among them. I sent it at that time to Nees, who confirmed my views, and mentioned this adulteration at the meeting at Düsseldorf.

I now come to the fifth commercial sort, viz:

The East India senna, which I consider as identical with that cultivated by Mr. Hughes, in Tinevelly, near Calcutta; and, therefore, in consonance with Royle and Wallich, I admit it as *Senna angustifolia*, the first of whom showed it to me beautifully drawn as *lanceolata*; Forskäl, in his *Illustrations of the Botany of the Himalaya Mountains*. It appears that by care and cultivation, the leaves of *S. angustifolia* here become broader and longer, for this Tinevelly senna is exactly one-third wider and longer than the leaves of the same species of senna growing wild in the East Indies and in Arabia. The color is also deeper green, which, however, arises from the care taken in drying them; for whilst the senna in Tinevelly is cultivated, and the leaves, like those of tea, gathered only when perfectly developed, the Indian atherer mows the wild-growing leaves (whilst yet imperfectly developed, and therefore whilst narrower and smaller,) like hay with us, and leaves them all exposed to

the air and moisture; and whilst they are yet for the most part not dry, they are pressed together in bales, where they undergo a fermentation. This is distinctly shown by the burnt black, and, by the oxidation of the Cathartin, yellow leaves. The proof that this color is not the natural one is furnished by the fact, that the above-mentioned Tinevelly leaves, and the more carefully collected pure Yemen and Mecca leaves, which come from the same plant, are, since the abolition of the monopoly, received direct from these parts, in a more beautiful condition than were formerly procured by way of Cairo. They are also justly to be preferred to those East India yellow leaves; for although Pomet, in his work written in 1688, prefers the yellowish senna leaves to all others, still he would have rejected them, because they represent as narrow-leaved senna (*de la pique*) the Mecca leaves, against which he pronounces, without further examination, the anathema, as well as against the green leaves *(obovata)* from Tripoli and Saida, with the intention of praising above all others the Alexandrian leaves, which were at that time probably not so much mixed with other leaves and the Cynanchum as now.

It was only after long continued personal examination and inspection of the dried original plants, that it has been possible to elucidate finally this obscure part of the materia medica; and I shall consider myself very happy if I have succeeded in this task.

Senna.

Familia *Leguminosæ*, tribus *Cassiæ*. *Decandria Monogynia.* Calyx pentaphyllus, petala quinque æqualia; antheræ supremæ tres steriles, infimæ tres radiatæ filamentis longioribus incurvis, petiolis *eglandulosis, foliolis basi obliquis.* Folliculi oblongi vel reniformes, lati, plano-compressi, margine membranaceo. *Semina* (parietalia, cum *dissepimentis*) cordata, tunica torulosa. *Podospermio,* sutura supera et hilo ovali conjuncto, cotyledonibus flavis, radicula et plumula coronatis.

1. S. OBOVATA: foliis pinnatis, tri-quatuor vel quinquejugis, foliolis *obovatis retuso-rotundatis*, mucronatis, basi angustioribus; folliculo supra semina verticaliter interrupto *cristato*. Seminibus *verticaliter torulosis*.

Syn: *Cassia senna*, Linnæi, sp. pl. 1, p. 559. Nectoux *Voyage d'Egypte*, tab. 1, page 19. Burmaan, *Flor. Ind.*, page 96, t. 33. Sieber *Flora Ægyptiaca*, et Delile *Flore d'Egypte*, fol. 420.

Cassia obovata et *obtusata*, Hayne. *Düsseldorf Abbild. Consp.* 347.

Cassia obtusa, Roxburgh, *Flor. Ind.*, 2., p. 344.

Cassia portoregalis, Bancroft.

Cassia Senna, Lam. ill. 1, 332.

Cassia obovata, Colladon, *Hist. des Cass.*, p. 92.

Cassia Senna Italica, Linn., sp. pl. ed. ii., i. p. 539.

Frutex habitat in Syria, Ægypto, Senegalia, Tripoli et India.

Senna de Aleppo in commerc. dicta.

2. SENNA ANGUSTIFOLIA. Foliis pinnatis, quinque septem-jugis, foliolis *angusto-lanceolatis*, glaberrimis subæqualibus, folliculis planis compressis oblongis et reniformibus.

Synon.—*Cassia angustifolia*. Vahl. Symb. Willdenow in *Herb. Berolin.*

Cassia Senna, Dr. Wallich, missa in *Horto Botanico Calcuttæ Colitar.*

Cassia Indica, Schumacher, *Plantelare*, t. i., page 577.

Cassia elongata, Lemaire Lisancourt.

Cassia acutifolia, Düsseldorfer Sammlung *exclus. Synonymis Consp.*, 346.

Cassia lanceolata, Forskäl, in Mus. Britan., exclus. description in *Flor. Ægypt. Arab.*, page 85, No. 58.

Cassia lanceolata, Dr. Royle, in the *Illustration of the Botany of the Himalayan Mountains*, tab. 37.

Cassia lanceolata, Herb. Wightii, No. 654 in Mus. Brit.

Habitat in Arabia, in Lohaya, Mecca, Yemen, et in India. In Calcutta, Tinevelly prope colitur.

Senna de Mecca in commerc. dicta.

3. SENNA ACUTIFOLIA. Foliis pinnatis quinque-jugis stipulis linearibus subulatis et pilosis ad basin petiolorum, *foliolis ovato-acutis* æqualibus nervo medio in adolescentibus piloso; folliculis oblongis plano-compressis.

Synonym: *Cassia acutifolia.* Delile *Flore d'Egypte.*

Cassia lanceolata. Düsseldorf, Sammlung, *exclus. Synonym. Consp.*, 345.

Cassia lanceolata. Dr. Kotschy, in Mus. Brit., No. 315.

Frutex habitat in Ægypti et Sennaar. *Cassia Alexandrina.* Miller.

Senna Alexandrina et officinalis in com. dicta.

4. S. TOMENTOSA. Foliis pinnatis quinque-jugis foliolis parvis *ovoto-oblongis*, pilosis mucronatis, folliculis adolescentibus nigris, velutinis; maturis sutura superiori pilis albidis ciliata.

Synonym: *Cassia ovata*, Merat et Lens? *Cassia acutifolia* varietas *tomentosa* Delile.

Habitat in Arabia et Nubia, inter folia *Sennæ Meccensis* ab aucture detecta et a clariss. Boré in Arabia et a clariss. Darnaud in Valle Dumrich in Nubia collecta.

Sennæ de Mecca in commercio dicta.

ART. XC.—ON THE PREPARATION OF HYDROBROMIC AND HYDRIODIC ACIDS.

By C. H. Mène.

Hitherto hydrobromic and hydriodic acids have been prepared by decomposing the phosphorets of bromine and iodine by a small quantity of water. Now without mentioning the considerable loss of substance, the serious and frequent accidents which occur in this reaction frequently prevent chemists from preparing these gases, and consequently from studying their properties. The means recently proposed, as the essential oil of lemon, napthaline, being either rare, expensive or of difficult preparation, I have considered it of sufficient importance to describe a new method of preparation, which I have recently employed with success, and which presents no danger, and is not accompanied by any loss.

To liberate hydrobromic acidgas, I employ the crystallized hypophosphite of lime obtained in the preparation of phosphuretted hydrogen from phosphuret of calcium. It is placed in a flask or retort with a small quantity of water; after which I add, by means of a long funnel, some liquid bromine; the reaction takes place instantly, without the assistance of heat, and hydrobromic acid is disengaged, and may be collected over mercury. It is merely requisite to place in the neck of the retort or the flask some pieces of cotton or of amianthus, in order to retain any bromine vapor which might be volatilized by the heat. The reaction of the bromine upon the hypophosphite of lime in presence of water will be easily understood; the water is decomposed, 4 parts of oxygen pass to the hypophosphite of lime, converting it into neutral phosphate, and the 4 parts of hydrogen are transferred to the bromine, forming hydrobromic acid:—

$$4Br + PhO,CaO + 4HO = PhO^5\ CaO + 4HBr.$$

To prepare hydriodic acid, I use the same salt, and follow the same mode of preparation, only it is requisite to assist the reaction by a little heat. The decomposition is similarly expressed by the equation

$$4I + PhO,CaO + 4HO = PhO^5 + 4HI.$$

Sulphite of soda may likewise be employed for the preparation of these two gases. With this salt it is not necessary to add water, as in general the crystals of commerce contain a sufficient quantity; I merely dip them in water, and then add immediately the bromine or iodine. It is necessary to assist the reaction by heat. The reaction is very simple. The bromine or iodine decomposes the water in presence of this salt; 1 equiv. of hydrogen is transferred to the bromine, forming the gas in question, and the oxygen converts the sulphite into sulphate:—

$$SO^2, NaO + HO + Br \text{ or } I = SO^5\ NaO + BrH \text{ or } IH.$$

It needs scarcely to be observed that the last method is preferable, as the sulphite of soda is commonly met with in commerce, whilst the preparation of the hypophosphite of lime is very troublesome. In the course of two weeks I have disengaged from 20 to 25 litres of these two gases without having met with the least accident; whilst with the old process I have frequently had explosions, which would certainly have produced serious consequences if the quantities operated upon had been at all considerable.

The proportions to be employed for the preparation of these two acids are—

By the hypophosphite of lime.		By the sulphite of soda.	
Water	1	Water	1
Iodine or bromine .	5	Iodine or bromine . .	3
Hypophosphite in crystals	4	Crystallized sulphite of soda	6
For 10 parts.		For 10 pts.	

Chem. Gaz. from Comptes Rendus.

ART. XCI.—ON THE ESTIMATION OF SUGAR OF MILK, AND THE DETERMINATION OF THE RICHNESS OF MILK.

By M. Poggiale.

None of the processes hitherto known being capable of furnishing, in a rapid and accurate manner, the determination of the richness of milk, I thought that if it were possible to estimate quickly one of its necessary constituents by a process of measurement, without using the balance, the problem would be solved. I think I have obtained this result by determining the proportion of sugar-milk.

Several specimens of pure milk, which I obtained for the purpose, were submitted to chemical analysis, and the following represents the mean of ten results:

Water	862.8
Butter	43 8
Sugar of Milk	52.7
Caseine	38.0
Salts	2.7
	1000.0

Thus, according to my experiments, one thousand parts of milk contain 52.7 parts of sugar. M. Boussingault, in a series of observations, found a mean of 50; a difference no doubt resulting from a different mode of operating. The quantity of sugar contained in milk is therefore considerable, and is subject to but slight variation.

The process which I propose is an application of that of M. Barreswill for the purpose of estimating the sugar of milk. This kind of sugar, in common with grape sugar, reduces the salts of copper, and it may be easily estimated by applying this reaction. The proportion of salt of copper decomposed will give the quantity of sugar of milk.

Preparation of the Test.—It is prepared by adding bitartrate of potash to a solution of sulphate of copper, and dissolving the precipitate which is formed by means of

caustic potash. We have then to determine with care the strength of the alkaline solution, which is effected by ascertaining the quantity of sugar required to decolorise a given quantity of the liquor. It is important to observe, that in this operation sugar of milk, and not cane sugar, is to be used.

I have made a few experiments with the view of establishing a test liquor, the value of which shall be known. The following proportions have always afforded a liquor twenty cubic centimetres, of which correspond to two decigrammes of whey:

Take of Crystallised sulphate of copper . . .	10	parts.
Ditto bitartrate of potash . . .	10	"
Caustic potash	30	"
Distilled water	200	"

The liquid, after being filtered, is limpid, and of an intense blue color.

Preparation of the Whey.—In estimating the sugar of milk it is necessary to separate the fatty matter and the caseine by coagulation. This is easily effected by putting fifty or sixty grammes of the milk into a flask, adding a few drops of acetic acid, and then raising the temperature to 40° or 50° Cent. A transparent liquid will be obtained by filtration. According to my experiments, 1000 parts of milk yield 923 parts of whey, 1000 parts of which latter contain about 57 parts of sugar of milk.

The testing of the Whey.—Twenty cubic centimetres of the liquid to be tested is transferred by means of pipette to a flask, which is preferable to a capsule because the change of color can be readily perceived. The liquid is to be brought to the boiling point. On the other hand, a burette, each division of which is the fifth of a cubic centimetre, is to be filled with the whey; and this is to be added, drop by drop, to the test liquor, keeping it continually agitated and heated from time to time, until the blue color has entirely disappeared. In the first instance, a yellow precipitate of hydrated suboxide of copper is formed, which

speedily becomes red, and is deposited in the flask. When the operation is finished, the quantity of whey which has been used is observed, and by a rule of proportion the weight of sugar in a thousand grammes of whey is determined.

We have here assumed that a thousand grammes of whey contains fifty-seven grammes of sugar, but it will be necessary to make allowance for variations to the extent of a few grammes. Most of the frauds which are practised with reference to milk would be discovered by estimating the quantity of sugar present, as they would be effected by the addition of water. Nevertheless, it might happen that the cream was removed without any addition of water, or that grape sugar or sugar of milk was added. In these cases, I ascertain by a simple and expeditious process the quantity of fatty matter, by adding acetic acid to the boiling milk and agitating them together. After it has cooled, ether is added, which dissolves the butter; and the ethereal solution is evaporated when it yields the butter. It is sometimes desirable to verify the results by repeating the estimation of the sugar of milk; and the arrangements being prepared, and the quantities approximatively known, this may be done in a few minutes.—*Pharm. Journ. from Journ. de Pharm.*

ART. XCII.—ON THE PRODUCTION OF ARTIFICIAL OIL OF RUE FROM COD-LIVER OIL.

By Dr. Rudolph Wagner.

It is well known that cod-liver oil, when mixed with strong sulphuric acid, furnishes at first a purple-red tenacious mass, which color almost immediately passes into a brownish red, and then into a dark-brown. If this mass be supersaturated with a caustic or carbonated alkali or an alkaline earth, and then heated, a penetrating odor of the essential oil of rue, (*Ruta graveolens*) is disengaged. To

procure the odoriferous substance in sufficient quantity for analysis, I mixed pretty considerable quantities of cod-liver oil and sulphuric acid, then saturated with potash or lime, and distilled with water. The water which passed over was turbid, and possessed an excessively strong odor of rue; but only in a few cases was I able to perceive any drops of oil on its surface. Other experiments, in which I treated the fatty acids separated from the saponified cod-liver oil in a similar manner, furnished no better results. Fish oil and train oil from train-oil soap, submitted to a similar treatment furnished the same result.

I am not able to state more of the oil obtained, than that it is of a light yellow color, lighter than water, boils about 572°, and possesses the pure odor of the oil. With respect to the remarkable production of this oil from train oil by the action of sulphuric acid and subsequent saturation with a base, I may observe, that it certainly exists as such in the train oil, and cannot be considered as a product of decomposition by sulphuric acid. I found amongst the volatile fatty acids of cod-liver oil butyric and capric acids. Now, if we bear in mind that Gerhardt has recently asserted that the oil of rue is the aldehyde of capric acid, $C^{20}\ H^{20}\ O_2$, which he rendered probable by converting it by treatment with nitric acid into a different acid of the formula $(C^2\ H^2)^n+4O$, pelargonic acid, we may be allowed to conclude that the sulphuric acid enters into a combination with the aldehyde of capric acid, or rather with the oxide of caprinyle, $C^{20}\ H^{19}\ O$, and that this compound is decomposed on the addition of a base, when aldehyde separates. This aldehyde, on becoming rancid, that is by the absorption of 2 equivs. oxygen, forms capric acid, $C^{20}H^{19}O^3+HO$. That the latter does not give rise to the production of the oil of rue is shown from the fact, that the capric acid is not at all altered by mixture with sulphuric acid.

The characteristic odor of the oil of rue or of the aldehyde of capric acid furnishes us with the means of detecting the

presence of capric acid, or rather of the aldehyde, which always accompanies it. For instance, when fresh butter is heated with concentrated sulphuric acid, and potash is added in excess to the melted brown-red mass, the odor of the oil of rue is distinctly perceptible amidst the penetrating odors of the volatile fatty acids contained in the butter. I obtained the same odor by submitting to a similar treatment various sorts of fish oil, a piece of herring, several kinds of cheese, &c.

I will mention, in conclusion, that a mixture of train oil and sulphuric acid saturated with lime having been kept several days before distillation, the distillate consisted of a turbid water, which no longer possessed the odor of oil of rue, but distinctly that of peppermint. This circumstance is interesting on account of the isomerism of the oil of rue with the camphor of the oil of peppermint.—*Chem. Gaz., from Journ. für Prakt. Chem.*

ART. XCIII.—MIXTURE OF CAMPHOR AND CHLOROFORM.

Messrs. J. & H. Smith, of Edinburgh, have discovered a valuable means of administering camphor in a perfect and concentrated state of solution; which consists in uniting it with chloroform, according to the following formula: solid camphor, three grammes; chloroform, one gramme. The solution occurs rapidly and completely. It is a truly curious fact which, perhaps, has no analogy in chemistry, where the relation of the solid to the liquid solvent is so great. The addition of a certain proportion of water, emulsinized with yoke of egg very fresh, does not cause the separation of particles of either camphor or chloroform. If you add to this emulsion a quantity of water sufficient to obtain a mixture weighing 120 grammes, (about 4 ounces) each tea-spoonful of the mixture contains about 25 centigrammes (3⅘ grains) of camphor.

The authors have placed this new camphorated mixture in contact with various pharmaceutical preparations, to see if any decomposition ensued. They have stated a certain number, in the presence of which camphor is maintained in a state of perfect solution; these are, a saline solution containing common salt and phosphate of soda, or an alkaline carbonate, a solution of muriate of morphia and sulphate of zinc, volatile alkali, acid liquids, and a weak solution of acetic, or muriatic acid. In the presence of water alone the mixture deposits camphor gradually in few days but this re-dissolves promptly by slight agitation.*—*Jour. de Pharm.*

ART. XCIV.—NATIONAL CONVENTION FOR REVISING THE PHARMACOPŒIA OF THE UNITED STATES.

The Convention for revising the Pharmacopœia, which met in Washington in January, 1840, adopted the following resolutions:

"1. The President of this Convention shall, on the first day of May, 1849, issue a notice requesting the several *incorporated State Medical Societies*, the *incorporated Medical Colleges*, the *incorporated Colleges of Physicians and Surgeons*, and the *incorporated Colleges of Pharmacy*, throughout the United States, to elect a number of delegates, not exceeding three, to attend a general convention to be held at Washington on the first Monday in May, 1850.

* Some of our physicians have prescribed a mixture of chloroform with oil of camphor—that obtained from the Dryobalanops camphora. This camphorous volatile oil is preferable to camphor alone for emulsionizing chloroform, and appears to have the medicinal properties of camphor, of which it is a strong solution. One part of chloroform, by measure, will form a perfect solution with 3 parts of camphor, by weight, and when the solution is rapidly effected, the temperature rises instead of diminishing, which indicates some chemical reaction.—Ed.

"2. The several incorporated bodies, thus addressed, shall also be requested by the President to submit the Pharmacopœia to a careful revision, and to transmit the result of their labours, through their delegates, or through any other channel, to the next Convention.

"3. The several medical and pharmaceutical bodies shall be further requested to transmit to the President of this Convention the names and residences of their respective delegates as soon as they shall have been appointed, a list of whom shall be published, under his authority, for the information of the medical public, in the newspapers and medical journals, in the month of March, 1850.

"4. In the event of the death, resignation, or inability to act of the President of the Convention, these duties shall devolve on the Vice President; and, should the Vice President also be prevented from serving, upon the Secretary, or the Assistant Secretary, the latter acting in the event of of the inability of the former."

In compliance with the foregoing resolutions, the undersigned, having been informed by the President of the late Convention, Dr. Lewis Condict, that he would be unable, from indisposition, to perform the duties assigned to him, gives notice, to the several Medical and Pharmaceutical bodies enumerated in the first resolution, that a Convention for the revision of the National Pharmacopœia, will meet in the city of Washington, on the first Monday in May, 1850. The undersigned also requests of the several bodies referred to, that they will fulfil the wishes of the Convention, as set forth in the second resolution; and, further, that they will transmit to his address, on or before the first of March next, the names and residences of the delegates whom they may appoint, in order that a list of them may be published, as directed in the third resolution.

GEO. B. WOOD, M. D.,
Vice President of the Convention of 1840.

Philadelphia, May 1st, 1849.

MINUTES OF THE PHILADELPHIA COLLEGE OF PHARMACY

At a Stated Meeting of the Philadelphia College of Pharmacy, held at their hall, Ninth month 24th, 1847. Present 15 members. Vice President Samuel F. Troth in the Chair.

The minutes of the last stated meeting were read and adopted.

The minutes of the Board of Trustees were read, detailing the interesting proceedings of that body for the last six months. Through their minutes, the College was informed that Charles L. Bache, a graduate of the Institution, now a resident of San Francisco, had been elected an associate member.

They also recommend Thomas Gegan and Frederick L. John, to the College, as worthy of resident membership.

Their minutes gave information that the following named candidates had applied for the Diploma of the College. They were examined by the Professors and Examining Committee, and recommended for graduation, which was unanimously agreed to by the Board, and they were accordingly declared duly elected Graduates of the College, viz:

Charles L. Bache,	Thesis on	Ficus Carica.
Samuel L. Costill,	"	Sanguinaria Canadensis.
Isaac W. Stokes,	"	Aralia spinosa.
T. Morris Perot,	"	Chloroform.
Avery Tobey,	"	Prinos Verticillatus.
Charles Hartzwell,	"	Asclepias tuberosa.
Samuel Hastings,	"	Anthemis nobilis.
Oscar Steele,	"	Aralia spinosa.
Wm. W. D. Livermore,	"	Cornus Florida.
Edmund A. Crenshaw,	"	Capsicum.

On motion, the College proceeded to the election of Thos. Gegan and Frederick A. John. The Chairman appointed Jacob L. Smith, teller, who reported they had each re-

ceived the requisite number of votes, and they were accordingly declared duly elected.

The minutes of the Board further informed, that a letter had been received from Dr. John C. Warren, of Boston, President of the American Medical Association, accompanying a resolution of that body expressive of satisfaction at the intention of this College to prepare and publish some plain directions for detecting adulterated drugs and medicines, and expressing a hope that a copy would be furnished to its next annual meeting. The proceedings of the Board were approved by the College, and the committee charged with this subject were encouraged to pursue their labors.

A member of the College communicated the fact that the Code of Ethics which were directed to be forwarded to the American Medical Association, held in Baltimore, in 1848, had been distributed among its members, and had been entered upon the minutes of that body.

The proposition to alter law 5, sec. 2, referred from last stated meeting, was fully discussed by several members, and several modifications were proposed.

It was believed by many members that the time had arrived when the standard of professional attainment should be elevated, and that those only who had availed themselves of the advantages of our School of Pharmacy, and submitted themselves to an examination for its diploma, should be entitled to the privileges of membership in the College.

The importance of the subject requiring further deliberation, it was, on motion,

Resolved, That a Committee of five members be appointed to to consider the subject in its various bearings, and report to an adjourned meeting of the College. The Chairman nominated the following members, viz: Ambrose Smith, Charles Ellis, Thomas P. James, Wm. Procter, Jr., and John H. Ecky.

The Committee on Latin Labels made the following report, which was directed to be placed on the minutes.

To the Philadelphia College of Pharmacy.

The Committee on Latin Labels respectfully report, that in accordance with the resolution of the College, they have revised the last edition of the labels, made such additions as they deemed advisable, and in order to give greater value to the book, as well as to supply a want which has long existed, they have at very considerable expenditure of time and labor, collated a set of labels for materia medica specimens, and have had them printed with the book. The committee believing that the demand will justify it, have caused fifteen hundred copies to be printed, which are now in course of sale.

In reference to the financial concerns of the committee, they will state that they have sold already about $300 worth of the labels, which sum, in connection with the funds in possession of the treasurer of the committee, are just about sufficient to cover the expenses of the edition.

CHAS. ELLIS,
WM. PROCTER, JR.,
On behalf of the Committee.

The Committee on the Adulteration of Drugs, and on the preparation of a Book of Directions for detecting adulterations in drugs and medicines, not being ready to report, were further continued.

A resignation of William H. Schively, accompanied by a communication from the Treasurer, informing that his certificate was returned and arrearages paid, was read and accepted.

To the Philadelphia College of Pharmacy.

The Committee appointed in Third mo. 1847, "To revise the Pharmacopœia, and report on such changes and amendments as they may think proper, and submit the result of their deliberations to the College at least six months before the sitting of the Convention," respectfully report:

That they have finished the revisionary labors committed

to their charge, except that portion which relates to engrossing and arranging the reports of the sub-committees, which will require the leisure time of the secretary during several weeks to accomplish. As the *convention* commences its sittings in May 1850, the committee ask to be continued to report in full to a Special Meeting to be held on the 5th of November next, at which time, if it pleases the College to appoint it, they hope to be entirely prepared.

In reference to the labors of the committee it may be proper to state, that soon after their appointment, they were convened by order of the Chairman, and a regular organization entered into similar to that adopted by the Committee of Revision in 1840; but as several years were to elapse before the report was to be presented, it was deemed most favorable to the object in view to defer the action of the committee to a time approaching that period; consequently they did not commence their labors in earnest until the 23d of April of the present year. Since that time they have proceeded regularly with the work, the three sub-committees reporting monthly to the general committee.

It should be stated that two members of the committee, viz: William Hodgson, jr., and Henry W. Worthington having resigned, owing to press of engagements; Charles Bullock and Alfred B. Taylor were appointed by the committee to fill the vacancies thus occasioned.

In conclusion the committee will reiterate their request to be continued to report to a special or adjourned meeting of the College to be held on the 5th of November.

D. B. Smith,
W. Procter, jr.,
Wm. J. Jenks,
John H. Ecky,
Robert Bridges,
Thos. P. James,
Chas. Bullock,
Dillwyn Parrish,
Jacob L. Smith,
Ambrose Smith,
Charles Ellis,
Alfred B. Taylor,
Jos. C. Turnpenny,
Joseph Carson,
Edward Parrish,
Committee.

Philadelphia, Sept. 24th, 1849.

On motion it was Resolved, that the Committee on the Pharmacopœia be continued, and that when the College adjourns, it shall adjourn to meet on the 5th of Eleventh month (November) next.

On motion it was Resolved that the Committee just continued be instructed to bring forward names of delegates to the Pharmacopœia Convention, to be held in Washington in 1850.

On motion it was Resolved to proceed with the election of eight trustees in place of those whose term of service expires by limitation. The Chairman appointed tellers, and the College proceeded to an election, when it was declared the following members were duly elected Trustees, viz:

Thos. P. James,	John Harris,
Jacob L. Smith,	Wm. J. Jenks,
Ambrose Smith,	Joseph Trimble,
Alfred B. Taylor,	Charles Bullock,

Then adjourned to the 5th of Eleventh Month next.

From the minutes,

Dillwyn Parrish, Secretary.

Editorial Department.

ADULTERATION OF DRUGS.—We have to acknowledge the receipt of a pamphlet, entitled a "Report on the practical operation of the law relating to the importation of adulterated and spurious drugs, medicines, &c., by M. J. Baily, M. D., Special Examiner of Drugs, &c., for the port of New York. Read before the New York Academy of Medicine, June 6th, 1849."

This report is in some respects a valuable one, as it exhibits to what extent the importation of deteriorated drugs has been carried on, even since the passage of an act for its prohibition. The author, Dr. Baily, states that

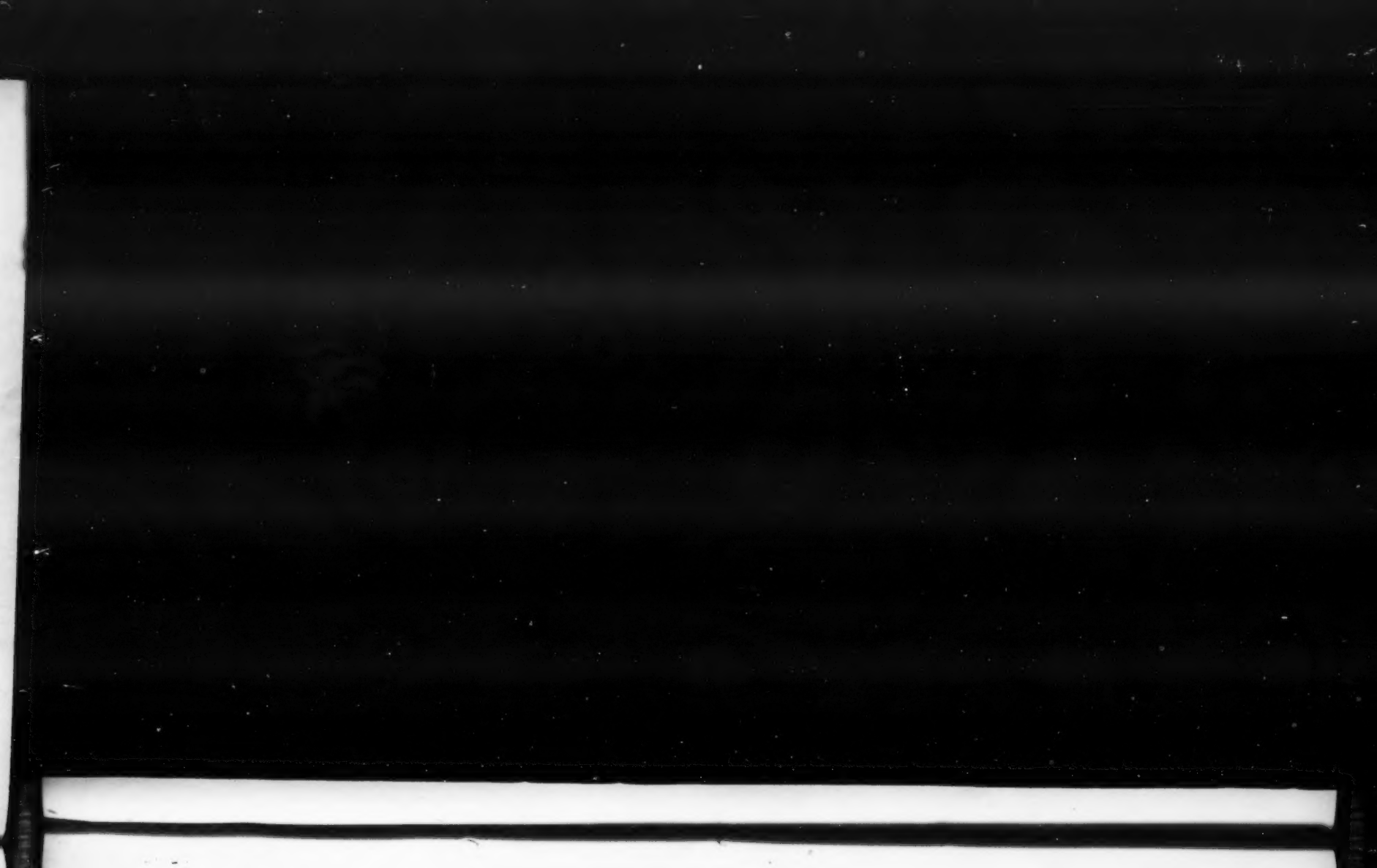
"The law took effect at this port on the 12th of July, 1848; and the following is a list of the more prominent articles of drugs and medicines, with the quantities and place whence imported annexed, which I have, during the months named, rejected under its provisions: to wit—

July, 1848,	7,581 lbs.	Rhubarb root,	from Canton.
August,	750 lbs.	Opium,	do. Marseilles.
do.	2,940 lbs.	Jalap root,	do. Tampico.
do.	2,249 lbs.	Rhubarb root,	do. London.
September,	646 lbs.	do. do.	do. do.
do.	1,414 lbs.	Gamboge,	do. do.
do.	545 lbs.	Rhubarb,	do. Hamburg.
do.	1,400 lbs.	Senna,	do. Leghorn.
do.	2,900 lbs.	Spurious Yellow Bark,	do. Bordeaux.
do.	875 lbs.	Rhubarb,	do. Canton.
do.	758 lbs.	Opium,	do. London.
do.	1,783 oz.	Iodine,	do. do.
do.	1,075 lbs.	Jalap,	do. Marseilles.
do.	4,275 lbs.	Rhubarb,	do. Vera Cruz.
October,	788 lbs.	Rhubarb,	do. London.
do.	227 lbs.	Myrrh,	do. do.
do.	13,120 lbs.	Spurious Yellow Bark,	do. Maracaibo.
do.	1,875 lbs.	do, do. do.	do. Bordeaux.
November,	412 lbs.	Myrrh,	do. London.
do.	1,280 oz.	Iodine,	do. Glasgow.
do.	860 lbs.	Opium,	do. Smyrna.
do.	185 lbs.	Rhubarb,	do. London.
December,	156 lbs.	Opium,	do. do.
do.	1,065 lbs.	Myrrh,	do. do.
do.	12,800 lbs.	Spurious Yellow Bark,	do. Santa Martha.
do.	392 lbs.	Jalap,	do. Vera Cruz.

January, 1849,	1,300 lbs.	Pectoral Paste,	from San Juan.
do.	2,071 lbs.	Rhubarb,	do. London.
do.	3,550 lbs.	Jalap,	do. Havanah.
do.	1,930 lbs.	Spurious Bark,	do. Antwerp.
February,	974 lbs.	Rhubarb,	do. London.
do.	1,992 oz.	Iodine,	do. do.
March,	1,104 oz.	Croton Oil,	do. do.
do.	4,894 lbs.	Senna,	do. do.
do.	1,345 lbs.	Spurious Bark,	do. do.
do.	404 lbs.	Opium,	do. do.
do.	1,150 lbs.	Valerian root,	do. Paris.
April,	425 lbs.	Opium,	do. London.
do.	1,273 lbs.	Myrrh,	do. do.
do.	550 lbs.	Jalap,	do. Vera Cruz.
do.	816 lbs.	do.	do. Tampico.
do.	1,450 lbs.	Sarsaparilla,	do. do.
do.	600 lbs.	Spurious Bark,	do. Barranquilla.

Together with smaller quantities of various articles which have been rejected from time to time, but which it is not necessary to enumerate here—making the entire amount, some 90,000 lbs. of various drugs, &c., which have, up to the present time, been refused."

After commenting on the valuable results of the law in question, as obtained at the port of New York, the author turns his remarks towards the business of domestic adulteration that is going on, and he is of opinion that the law of Congress is only the first step in the reforms which are necessary to rid our land of this monstrous evil. It was a common remark of those who were lukewarm towards the measure, that its passage would merely transfer the evil from Europe to our own shores, that the inducement to adulterate would be increased, and that yankee ingenuity would find a fruitful field for its exercise in this villanous business. However true these views, and we believe they are true to a great extent, it always was the design of the reform advocates to begin with the foreign adulteraters, because, so long as they were permitted to pour their vile productions on our shores, the very perfection of fair dealing, on our part, would be useless. Now that it is possible to begin right at home, let us use all our endeavors to do so. Now that good drugs only, it is presumed, enter our markets from abroad, let us leave no stone unturned to preserve their goodness unimpaired by sophistication. The best drugs are sufficiently prone to depreciate in value by the silent but sure influence of time and exposure to light, air, and variable temperature, without assistance from the villany of the unprincipled.

The action of Legislatures in a matter that must eventually rest with the conscience of individuals, is not always effective. Laws—good wholesome laws—will be hailed with satisfaction by all honourable members of both branches of the medical profession and by respectable

drug dealers. But of what avail are legal enactments, when those who put them in force are not capable of deciding just where they should be brought to bear? Of what use is the present congressional Act, if the Special Examiners are not qualtfied men? None—worse than none—for under the cover of their inspection worthless articles would be scattered over the land with the custom house stamp upon them. Nothing will be so effectual therefore, as the dissemination and cultivation of that practical knowledge which will enable the medical and pharmaceutical consumers, if we may so speak, to judge for themselves. Take the graduates of any one season, from even the best of our medical schools, and the majority of them will be found little versed in the practical means of detecting adulterations, or even in the knowledge derived from books. Take the majority of those who sell and prepare drugs, and it will be found that there is a great deficiency in this knowledge. We must, therefore, begin at home. Let every apothecary exercise himself in the critical examination of drugs, microscopically, chemically, and by their more sensible properties. Let every physician, old and young, give more attention to the sources whence he is supplied with drugs and medicines. Let physicians in general keep a wholesome watchfulness over the apothecaries that supply their patients and themselves. Not that querulous fault-finding suspicion, which is sometimes exhibited by medical men whose judgment is far short of their pretensions, but that brotherly watchful interest which is as fruitful in good, in medical morals, as in the ordinary economy of society. Finally, let the physician and the pharmaceutist keep each within his own sphere of action, and by mutual good feeling jointly advance the interests of their benevolent profession, whose kindly and soothing influence extends into every home over our wide spread country.